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LEIBNIZ'S MESSAGE TO US*

BY WILMON H. SHELDON

In what follows I set forth certain doctrines of Leibniz which I believe to be portentous for present-day philosophy. Leibniz offered a system which he thought would harmonize the fighting factions of philosophers; and now, three hundred years after his birth, the fight still goes on—in fact, has waxed more intense, since there are more factions today than ever and each claims to have discovered the one sure way out of the mess and muddle. Yet I think Leibniz sensed, as no other modern thinker has done, what a true synthesis would be like—sensed it at least, even if he did not fully work it out. Let me then, instead of picking flaws in his system, as is usually done, try to discern the pattern of the synthesis he presented. Certainly, if our philosophy is to be a serious concern and not a sparring of wits, we sorely need such a pattern.

To be sure, historical scholars may say that I have misinterpreted Leibniz. That matters little. Enough if I read him in a way not too unlike the ways of standard histories and thereby get suggestions helpful to our need. If Leibniz, or Plato, or Duns Scotus, or whosoever, has been understood to defend this or that view, it is after all the *view* that we should be interested in, rather than the precise source of the view.

Now before going to the body of his doctrine, I would emphasize its spirit; for in philosophy if not in life the spirit is responsible for the body and the key to the understanding of it. Leibniz wrote of himself, "It is characteristic of me to hold opposition as of little account, exposition as of much account, and when a new book comes into my hands I look for what I can learn from it, not for what I can criticize in it."[1] He was a truthseeker, not an error-seeker. He was not a closed but an open and progressive mind. So he wrote, "I have changed and changed again, according as new light came to me."[2] And his changes led him to see truth in many

* This is the first of four papers read at the meeting in commemoration of the tercentenary of Leibniz held by the Fullerton Club at Bryn Mawr College, May 11, 1946.

[1] Letters to G. Wagner. Gerhardt ed., VII, 5, 6; trans. Latta, 1, 2.

[2] Letter to T. Burnet. Gerh. III, 205; Latta, 13.

seemingly opposed views. "I have found that most of the philosophical sects are right in a good part of what they maintain, but not to the same extent in what they deny. The Formalists, such as the Platonists and Aristotelians, are right in seeking the source of things in final and formal causes. But they err in neglecting efficient and material causes, and in inferring (as did Mr. Henry More in England, and some other Platonists) that there are phenomena which cannot be explained on mechanical principles. But on the other hand the Materialists, or those who hold exclusively to the mechanical philosophy, err in setting aside metaphysical considerations and in trying to explain everything by that which is dependent on the imagination. I flatter myself that I have discovered the harmony of the different systems and have seen that both sides are right, provided they do not clash with one another."[3]

We see here the spirit of inclusiveness, of all-fairness. And the same is shown in his attitude toward history. Unlike Descartes, unlike Spinoza, unlike our present-day reformers of philosophy, he sought for truth in the past as well as in the latest discoveries. In particular this appears in his reaction to the scholastics —a reaction which we of today much need to import into our thinking. The opposition to scholasticism was in his day extreme; it still is so, perhaps more bitterly extreme in our new school of "Naturalism." Not so for Leibniz, who re-emphasized the truth of the entelechy-view. It was part of Leibniz's own theory of development in the monads that the present is big with the future, as the past was big with the present, and therefore nothing in the past is to be wholly set at naught. To quote again: "When we penetrate deeply into things, we observe more reason than would be believed in most of the sects of the philosophers . . . these [doctrines of past sects] are combined together as in a centre of perspective. . . . We have failed to accomplish this by our sectarian spirit, limiting ourselves by rejecting others."[4] And "the writings of Leibniz are full of similar passages."[5]

The spirit, as I said, is that of a truthseeker; a real truthseeker looks for truth in every possible direction. Perhaps that accounts for the fact that Leibniz worked so little for publicity. He published but a small fraction of what he wrote and thought: one book,

[3] Letter to Rémond. Gerh. III, 607; Latta, 108.

[4] Letter to Basnage. Gerh. IV, 523; Latta, 155.

[5] Latta, *ibid.*

one preface to a collection not his own, and about eight journal articles. After writing the long and elaborate *New Essays* in criticism of Locke, he would not publish them because Locke had meanwhile died and couldn't reply. Which of us would have done so? Yes, Leibniz sought truth for its own sake; and that is why, unlike most professed philosophers, he sought a harmony of the schools, truth in all quarters, as true in one as in another. This spirit of his was what made the body of his teaching, as we are now to see, a system of *equal opportunity for all things.*

This I say is his essential teaching: every element, phase, or aspect of reality is *fundamentally* as real as every other. In political terms, the universe is an individualist democracy. To bring out the notion, compare it with the Hegelian type of synthesis. Hegel believed that his own system included all other systems as inferior parts, even as the Absolute Spirit includes all lesser forms as lower degrees of reality. For him the lower drew all their being and value from the system as a whole; they had no independent life. It was a typical German or Nazi universe. For Leibniz on the contrary, the lesser (so-called) have a status in themselves; they are ultimately real apart from one another, each with its own irreducible values. And I put it to you that this offers a far more generous, more synthetic metaphysic; for it is able to include many, even an uncountable number of ultimate reals, while the Hegelian type permits but one.

Come then to the body of Leibniz's philosophy, to see how this free-for-all or equal-privilege metaphysic is revealed in his several doctrines.

I. THE PLURALISM

Begin with the monads. As all know, there are an infinite number of them, each and every one mirroring the whole scheme of things. In having this function all are equal. And they are as independent of one another as they are equal. No monad is affected by another, none influences another. Each is a self-enclosed substance, an active being whose activity consists in developing its own content and make-up into ever fuller, more intense, and more definite expression. Not only are the monads equal in possessing these functions of representation and self-development; they are equal in respect of endurance. Each is immortal, each naturally indestructible. And together they include all being;

nothing exists save the monads (and the correspondence between them), and they comprise all conscious, all living things, all inorganic things, all of them being in the last analysis mental. So far then, see the scheme of equality. The American Declaration of Independence, written some sixty years after Leibniz's death, and by men who knew little or nothing of his philosophy, sounds the same note: "All men are created free and equal." Is it not natural that we in the U.S.A. celebrate his birthday? We sense a kinship with this great thinker, even if the sensing isn't intellectualized into an acceptance of his many-sided metaphysic.

"All men are created free and equal." True, we don't take this statement as sufficient; we know it needs explanation, perhaps it must be qualified. We know that men are not born with equal capacities. The psychologists of today have demonstrated by a very thorough empirical investigation that men are unequal in their intelligence quotients.[6] And we believed it anyway. So did Leibniz, even in the face of his sweeping claim that all monads equally possess the trait of mirroring the universe. He couldn't overlook the obvious fact of grades in the monads: some of them, the intelligent human ones, mirror the world rather clearly and distinctly in their thinking and their rational conduct; others, the conscious animals, rather darkly, and still others, the so-called non-living ones, darkest of all. He admitted that these grades are more or less fixed and thus make up the general order of nature, established by the First Cause of all things. How then did he reconcile his equality-view with the plain facts? By the old Aristotelian act-potency relation, which of course Descartes and the other thinkers of his age rejected, but which his synthetic spirit bade him accept and use. All monads for him are potentially mirrors of the universe, though actually not all are given the privilege of realizing that potency to the same degree. As our New England philosopher Emerson somewhere says, "everything in nature has all the powers of nature"; but nature is so ordered by the Divine Author that not all these powers can be equally realized by all. Why then? Leibniz answers, because it is better so. Well, why is it better? Because it makes room for a greater number of monads than there could be otherwise; a richer, fuller universe, indeed a universe of maximum richness and fulness. Now to see how it does so.

[6] L. L. Thurstone, "The Intelligence of Men," *Scientific Monthly* (Feb., 1946).

II. WHY THE MONADS ARE GRADED

The monads are distinct, are they not? So then they must be distinguishable. How else can a rational thinker distinguish them than by seeing some trait in one that is not in another? Even if we with our coarse faculties can't discern it, such a trait must be there. This is the principle of the "Identity of Indiscernibles." How then can one monad differ from another? In its internal make-up, of course. But the internal make-up is so far the same in all, being the mirror-picture of the universe. There is but one possible way, says Leibniz: they must differ in the degree of clear-distinctness with which they represent the whole. All do represent the whole potentially: all are born free and equal in that respect. But they must be distinct from one another—how else free? Hence the equality cannot hold of the actual fulfilment of their representing capacity. Hence the necessity of grades. The only distinctions are distinctions of degree—degree of success in the mirroring-function. There is no ultimate distinction of kind; the so-called physical things are potentially as mental as the minds. So the grades are a logical necessity, due to the fact that the monads are distinct individuals. And the more grades there are, the more individuals there are, and the richer is the universe in variety, variety of being and of opportunity—and so far the better. And doesn't it follow that the best of all universes will be the one with the greatest number of grades? So Leibniz felt; whence he concluded that they are infinite in number, each shading minutely toward the next—in short, they are a continuum. Nature is a vast continuum of monads, each differing from its neighbors in some infinitesimal degree, yet discernibly if we had the acumen to see it. Here the Identity of Indiscernibles comes to mean the command: "Look closely enough and you will find a positive difference in the content of any two phenomena." And thus the inequality of the grades, registered in the Identity of Indiscernibles, is seen to be the form which the principle of maximum synthesis or equal opportunity must of rational necessity assume.

Rational necessity, did I say? But Leibniz seems so far to have taken for granted, quite without proof, that the beautiful ideal of universal opportunity is an actual principle at work in nature. Why after all should the *good* control the *facts?* Is Leibniz just a Pollyanna? Far from it. He is a thorough ration-

alist. He is more of a rationalist than Descartes, more even than Spinoza. Descartes ascribed the principles of reason to the will of God, and Spinoza's system was founded on axioms which he simply assumed. But Leibniz believed in demonstrating the axioms. For Leibniz there was no irrational principle of good, no arbitrary choice of God that all things must work together for a maximum of value. The principle of maximum goodness was for him a rational necessity. The plurality of the monads, their infinite number, the graded continuum, the pre-established harmony, the very being of this best of possible worlds—all these are for Leibniz deducible from the single perspective of rationalism. Not even Hegel, acclaimed as prince of rationalists, can compare with Leibniz in this respect. And we must dwell on this if we are to grasp the truly synthetic character of his system.

III. LEIBNIZ'S RATIONALISM

Leibniz says that he is a rationalist, and his teaching bears it out. He writes in the *New System,* "It always seemed to me that there was a means of establishing something solid in philosophy by clear demonstrations."[7] And in the *Monadology,* "In what I have just said may be seen the reasons *a priori* why things could not be otherwise than they are."[8] And as we know, he declared that all reality is controlled by two principles, the P.C. (Principle of Contradiction) and the P.S.R. (Principle of Sufficient Reason). What is rationalism indeed but the belief in controlling principles? Now the P.S.R. is precisely what we are here seeking, since it has the unique office, for Leibniz, of guaranteeing the power of the good throughout reality. Yet before bringing this out, let us see the part played by the P.C., which is in its way quite as indispensable to the synthesis.

(1) *The Principle of Contradiction: Source of Pluralism in Being*

The working of the P.C. is what justifies the pluralism of the free and equal monads. For it says: whatever is real is just itself and cannot be what is other than itself. Reality must then be made up of individuals, each exactly what it is and in no slightest degree sharing its being with any other. That is why no monad

[7] Latta, 299.

[8] Latta, 250.

can influence another, why all are free and independent. To influence another, some part, phase or trait of one would have to be transferred to and embodied in the other. If the motion of the cue influences the billiard ball to move, the motion of the cue must in some part be transferred from cue to ball. If the like happened between monads, some part of one monad would then become part of another, and the self-identity of the first would in some measure cease to be. So the P.C. drives Leibniz to the view of the windowless monads. It is strict Aristotelian logic. Logic is for him the one key to reality. That is why he worked so much in mathematics, which stems from arithmetic. Why is arithmetic so precise, so unmistakably true? Because it starts with pure individuals which have no connotation, nothing but this-and-no-other, nothing that could be ambiguous or misunderstood; and all arithmetic does is to count them. No wonder that this rationalist sought to found a *Characteristica Universalis,* reasoning from the simplest individual notions, even as arithmetic reasons from pure individuals. In fact, what is more obvious than the likeness between Leibniz's graded continuum of monads and the arithmetical continuum of ordinal numbers? Note here the difference between the rationalism of Leibniz and that of Hegel. I said just now that Leibniz was more rationalist than Hegel. Hegel was no mathematician, no devotee of precision; and why? Because for Hegel the world contains no true individuals; the only individual for Hegel is the One Absolute Spirit, each part or element of it shading off into the rest. Hegel therefore cannot demonstrate *how* one part of the world implies another; he can only point to the fact that the parts appear intertwined. There is no deducing the fact of gravitation from the fact of a space-filling body: you can only point out that in the world they are given as universally connected. You may indeed, as do the Hegelians, go on to declare that the mutual implication of all things is a postulate of reason. But you can never, from that postulate alone, prove a specific implication from a specific premise. In arithmetic and other mathematics you can do this. These branches show a working rationalism, not a Hegelian postulated rationalism. Leibniz the productive mathematician was so far a working rationalist, a genuine rationalist. And he worked his rationalism in respect of the P.C. when he demonstrated that by this principle we may be sure of the ultimate plurality of being.

But this doesn't account for the *maximum* plurality which Leibniz defends, nor for the maximum good on which it depends. To do that was, I said, the office of the P.S.R. So we pass now to the consideration of this principle. And we are to see that for Leibniz it is even more rationalist than the precision-loving P.C.; more so, because more positive, more fertile for explanation. The P.C. after all assumes the real world as an already given manifold; it simply tells us that the manifold must be individuated, a rather negative trait, each real being excluding others. But the P.S.R. is to explain why there is any world at all and why, being real, it must contain a maximum of being and goodness. Thus it is in a way more fundamental than the P.C., though not including or demeaning the latter; for the P.C., true to its own dictum, is individually distinct from the P.S.R.

(2) *The Principle of Sufficient Reason: Source of Being and Good, and in Maximum*

Leibniz's essay *On the Ultimate Origination of Things* has been, I think, less appreciated than the *Monadology,* being narrower in scope; but it is correspondingly deeper in penetration—the deepest wellspring of rationalism, perhaps, in history. In this work he says, "From the very fact that there exists something rather than nothing, it follows that in possible things, or in possibility or essence itself, there is a certain need of existence or, so to speak, a claim to exist, in a word, that essence of itself tends to existence."[9] Leibniz here attacks the mystery of being in pure rationalist fashion. There must be a reason why there is a universe rather than nothing at all; as this reason cannot be found in anything real (for that too would need accounting for) and certainly cannot be found in nonentity, there is but one alternative: it must lie in the very nature of possibility. For possibility, the possibility of this or that, of any being at all, of no being at all, is truly predicable of the original state of affairs, and indeed must be so predicated. Anything or nothing might be, we say; we cannot avoid the "might." Hence possibility must have in itself a tendency to realize itself. And this is of course a quite general statement, holding of all conceivable possibles; each tends to be and will be, unless something already on hand interferes. And in the beginning nothing can interfere, wherefore there will be realized a

[9] Latta, 340.

maximum of being—all possibles will come to be except where some conflict with others. "Hence," Leibniz continues, "it is most evident that out of the infinite possible combinations and series of possible things there exists that one through which the greatest amount of essence or possibility is brought into existence."[10] This statement too is obviously general. It still holds after the world has come into being. It holds in the present world. Possibles are intrinsically tending to be realized, as many as can be and as fully as can be, now and forevermore. Everything is tending always to unfold its latent potencies, to realize its capacities. In this actual world of monads, each monad is striving toward that end, it must *progress* toward that end. So, all through nature, this tendency to realize all potencies, this principle of plenitude, as Lovejoy has so aptly termed it, is ever making the fullest possible wealth of being. Such is for Leibniz the P.S.R., the principle which accounts for "truths of fact" or "contingent truths" as he calls them—that is, for the actual world. And since for Leibniz as a rationalist, *good* is definable as realization of a thing's capacities, the P.S.R. is ever making the best possible world. Here then is the rationalist justification of the Pollyanna optimism.

True, at this point Leibniz interposed his view of God as perfect First Cause, to whom the existence of this best of possible worlds is due. As matter of fact, his system simply doesn't need the kind of first cause which he interpreted Deity to be. God was for him not a creator, nor a self-expander as with the emanationists, but a "fulgurator"—a queer notion, as it were a compromise between the other two. In any case Leibniz's God, by the P.S.R., could have made no other world than this one. The "inclining reasons," as Leibniz called them, are just as compelling as the necessary ones. He has no idea of free choice in his system; hence there is no office which his Deity performs which would not be performed by the P.S.R. alone. But I am not urging that he worked out his synthesis to the full.

Usually he ascribes different degrees of capacity or push to the various possibles and usually he takes for granted some incompatibility amongst them, so that not all can be realized together. There is one passage[11] where he finds all the possibles compatible—it seems to conflict with the view of the *Ultimate Origination;* but let

[10] *Ibid.*

[11] Gerh. VII, 161, 162; trans. Langley, *New Essays,* Appendix, 714, 715.

it pass. At any rate, the tendency toward a maximum of being would give rise to as many different sorts of being as possible, and would produce all grades of differences. The continuum is a consequence of the nisus toward fullest being and fullest good. So Leibniz wrote, "Each possible thing has the right to aspire to existence in proportion to the amount of perfection it contains in germ."[12] And, "All possible things, that is, things expressing essence or possible reality, with equal right tend to existence in proportion to the quantity of essence or reality, or in proportion to the degree of perfection which belongs to them. For perfection is nothing but quantity of essence."[13] And he explicitly declares that this common tendency to self-realization entails a progress without end: "Although many substances have already attained a great perfection, yet on account of the infinite divisibility of the continuous, there always remain in the abyss of things slumbering parts which have yet to be awakened, to grow in size and worth, and, in a word, to advance to a more perfect state. And hence no end of progress is ever reached."[14] These words almost suggest that the lower orders of being—the lifeless, the plant, and animal—may some time awaken into the spiritual life.

Now we can see, too, why Leibniz had to say that all the monads possessed the same function of mirroring the universe. To mirror the universe is to possess all the powers of the universe in one's self. Why then should each monad be the equal of every other in possessing all of these implicitly or potentially, even though this potency is not equally realized in all? If each monad is a self-enclosed being, as the P.C. dictates, then nothing outside it can in any way interfere with it. It can, so to speak, do or be whatever it wants. Well, how much does it want to do or be? Remember now that by the P.S.R. all possibles tend to realize themselves unless interfered with by some external being. But there is no external being that can interfere with what goes on within any monad. So all possibles will tend to be realized within any one monad. Which is only another way of saying that the monad wants to do or to be everything in and of itself—it wants to grow without end, to mirror the universe, to comprise within itself all the sorts and conditions of being and action that can occur in

[12] *Monadology*, ¶54; Latta, 247.

[13] *Ult. Orig.*; Latta, 340.

[14] *Ibid.*, 351.

nature. And thus is Leibniz's democratic ideal of a free-for-all equal-opportunity universe grounded on both the P.C. and the P.S.R., on individualism and plenitude. Reason speaking in Leibniz's voice says to all candidates for being, to all phases and perspectives of reality, to all systems, "Come one, come all, both great and small." Some are greater, yes, some smaller, but none are truer, all are true or real in their own right, independent of the rest, and all are realized in proportion to their aspiration.

IV. THE TWOFOLD PATTERN

I have not tried to assess the truth in detail of Leibniz's proffered synthesis. The point I would bear heavily upon is the type or pattern of it. It was an attempt to show that reason not only indicates but also vindicates the truth of the schools, save where they deny one another, since each is a perspective of reality from its unique point of view. As the monads mirror the universe from their respective vantage-points, so do the systems of metaphysics, in their positive theses. In fact, reason itself has synthesis in its very make-up. Reason is not one principle—e.g., that of mutual implication of all things—but two principles, and the synthesis of the two. One of these is the principle of fairness, the other that of inclusiveness or largeness; both together give magnanimity to philosophy. Fairness is guaranteed by the P.C., which grants to each perspective an independent and ultimate truth of its own. Largeness is guaranteed by the P.S.R., which envisages all conceivable perspectives, all possible points of view, as having some claim to truth. For a proper synthesis, both are required. The P.S.R. alone might provide a Hegelian type of synthesis in which each perspective is true *only* as a limited aspect of the whole and therefore if taken as final, partly false. From this position of inferiority and partial error each perspective is saved by the P.C., which gives it final truth by itself. On the other hand, if the P.C. were reason's sole principle, there would be no motive for including all possible perspectives and a narrow view of the world would result. The urge to breadth of view is provided by the P.S.R., the principle of plenitude; the ultimate truth of each view by the P.C., the principle of independence. Thus we discern the reason why this Leibnizian pattern is really synthetic: namely, because it is twofold. No single monarch can rule the domain of truth; he must have a mate to introduce the synthetic spirit.

Leibniz was an idealist and rather of the Platonic-Pythagorean sort. His way was the way of aspiration rather than empirical verification; he dealt with possibles, and doing so, he sensed the ideal form of philosophical synthesis. Doubtless he did not carry it to the full; what one man could do so? But his gift to posterity, to us, is the pattern of it. No other modern thinker has approached him in this regard. It is for us to realize this pattern, to find the outstanding types of metaphysic harmonized in a systematic unity, yet at the same time each type giving truths which would be just as true if all the rest were false. If we don't do it—well, where do we philosophers think we are coming out, with our increasing sectarian strife and our increasing preoccupation with techniques which have no bearing on life or reality?

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LEIBNIZ'S JUDGMENTS OF FACT*

By Leroy E. Loemker

"Three classes of philosophers," wrote Georg Simmel in his journal, "the first hear only the heart-beat of things, the second that of universals, the third of persons—and a fourth," he added, "the professors of philosophy, who hear only the voice of the literature." Leibniz is great, among other reasons, because of his creative efforts to combine all four interests, but this same fact has also left him at the mercy of his critics, who are more one-sided. Even more than usual, his interpreters have insisted on taking his thought on their own terms rather than his; and though the prominence and brilliance of the minds who have rethreaded their way through the labyrinth of his work bear witness to his stature, each has insisted upon closing all entrances but one, and then upon holding that his own discovered path is the only way through the maze. This is a severe historical fate for one who had not only a universal mind but a universal purpose, who was always concerned with convincing many rather than with completely satisfying a few, and who never found leisure enough, in fifty years, to bring into a single unified focus the structure of meaning and existence upon which he believed the special perspectives which he discovered in so many fields must converge. The exclusive particularity of the critics has therefore repeated itself again and again in the same pattern: first each approaches Leibniz from what he chooses to regard as an adequate perspective, then he reconstructs his thought as it should be disclosed from this perspective, and finally he rejects those parts which do not in fact conform to the pattern he has worked out.

Certainly if such exclusive particularity can do justice to so universal a mind, those who seek the door through his logic do so with the greatest reason, for Leibniz did propose a strict method of analysis and synthesis, and unlike some logicians, sought actually to apply it in his investigations. The three great interpretations undertaken from the logical side, unfortunately, have so confused method with logical theory as to do violence to Leibniz's own opinions.[1] They assume "that all sound philosophy," in Russell's

* Read at the meeting in commemoration of the tercentenary of Leibniz held by the Fullerton Club at Bryn Mawr College, May 11, 1946.

[1] Ernst Cassirer, *Leibniz' System in seinen wissenschaftlichen Grundlagen* (Giessen, 1902). Louis Couturat, *La Logique de Leibniz d'après des documents*

words, "should begin with an analysis of propositions,"[2] whereas Leibniz himself frequently asserted that the knowledge of existence must begin with two facts—"that we think [in Descartes' broad sense of the term], and that there is a great variety in our thoughts."[3] The purpose of this paper is to correct the critics and to examine some of the conditions involved in Leibniz's application of logic to his pluralistic and temporalistic metaphysics of existence.

The brilliant historical and systematic analysis by Couturat of Leibniz's logical studies ends by neglecting the relevance of logic for existence entirely. Couturat does argue, in his introduction, that Leibniz sought to establish a panlogistic metaphysics purely on the basis of his logic. His chief evidence is the widely discussed *Primae Veritates*,[4] which he himself dates in the years prior to "the little discourse on metaphysics" of 1686, and in which Leibniz uses an analytic theory of the proposition to support his notion of the individual. But as Leibniz fully recognized, this work cannot establish a panlogism, and even less a metaphysics of plurality and change, for it professes to be only a derivation of his fundamental principles from the laws of identity and reason. Only Couturat's erroneous inclination to consider definition and demonstration as purely analytic processes would support his interpretation that Leibniz here proposed a complete metaphysical analysis; as the method of deduction had been described to Conring somewhat earlier, it was one of progressive synthesis since the definitions which are introduced in minor premises bring fundamental principles into specific application in various special realms of meaning.[5] It is not surprising, therefore, that Couturat claims no determinative metaphysical rôle for the great incomplete body of Leibniz's logic itself, but treats it as the science of the structure of meaning, his chief criticism being that Leibniz's loyalty to Aristotle conflicted with his own efforts to develop a broad and unhampered logic of symbols and relations.

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inédits (Paris, 1901). Hereafter referred to as Couturat L. The *Opuscules et Fragments inédits de Leibniz* (Paris, 1903), will be designated as Couturat OF. Bertrand Russell, *A Critical Exposition of the Philosophy of Leibniz* (London, 1900).

[2] Russell, *op. cit.* (2nd ed., 1937), 8.

[3] Gerhardt's edition of Leibniz's philosophical works (G), I, 370. His edition of the mathematical works will be indicated as GM.

[4] Couturat OF, 518–523. See Couturat L, x, and *Revue de Métaphysique et de Morale*, 10 (1902), 1–25.

[5] G I, 194 f.

By this restraint Couturat was able to put into their proper subordinate places certain doctrines of Leibniz which others have magnified. He recognized that the logical calculus is inseparable from the universal characteristic, or science of symbols and formulas, since ratiocination is itself inseparable from representation, and that it is in fact only a special case of this more general science, restricted to the relation of compounding and dividing terms, and the processes of equating and substituting identities. The result is that though the proposition is the fundamental unit of thought, it is not the fundamental unit of meaning; as Leibniz himself said, implication exists to establish true propositions, true propositions exist to establish consistent notions. Propositions are reductive processes to serve the analysis and synthesis of structures of meaning. And however universally Leibniz may have stated his principle that in every true affirmative proposition the predicate is included in the subject, expressly or virtually, this must be regarded as an abstraction from a more concrete theory of the proposition in which the composite subject is equivalent to the product of its predicates and can be substituted for them. Finally, Couturat recognized the inconsistency in Leibniz's treatment of negative propositions; considering them merely a denial of the relevancy of an affirmative proposition for reality, Leibniz was inclined to neglect them. Yet he also held that the incompatibility of ideas is a factor in creation, since existence is separated by a wide gulf of determinateness and non-existence from total possibility. Couturat's studies therefore tend to emphasize the relation of logic to human judgment rather than to metaphysics.

Of the second great criticism from the viewpoint of logic, Russell's, the opposite is true. Granting that the five premises from which he reconstructs Leibniz's philosophy were really Leibniz's primary principles—which they were not—Bertrand Russell's systematic analysis is as compelling as his historical appraisals are unconvincing. Assuming that Leibniz's basic logical principle is that of the inclusion, connotatively understood, of the predicate in the subject in every proposition, he argues that Leibniz built upon this a good, esoteric metaphysics, which he suppressed because the subject-predicate form of proposition cannot express relations between substances or modifications of the same substance, and the principle therefore led logically to a monism like Spinoza's.[6] On

[6] Russell, *op. cit.*, 5, 202; cf. *A History of Western Philosophy*, 593, 595.

the other hand Leibniz had a popular theological philosophy to which he restricted his later thinking, and which he freely published for the edification of the courtly patrons and noble friends upon whom he depended for patronage and favor.

The strong antipathy which Russell feels toward Leibniz's theological opinions and purposes seems to have blinded him, at this point, to the entire cultural climate and to the unity of Leibniz's scientific, philosophical, logical, and political plans for the alteration of that climate. Thus the work which he regards as "the best account [Leibniz] ever wrote of [his system],"[7] because it uses the argument from the nature of propositions to the existence of individuals, is at the same time the most theological of Leibniz's shorter expositions of his thought. It contrasts rather sharply in this respect with the more mature *Monadology* and *Principles of Nature and of Grace,* which begin by establishing the grounds for individuality instead of with the problem of God's grace, to which the controversy between Arnauld and Malebranche had drawn Leibniz's attention before he wrote the earlier immature work. The record is clear that Leibniz was kept from printing many of his works, either because he himself was unsatisfied with them or because the critics to whom he first submitted his drafts could not understand them, or found difficulties in them. To say that he published only for the edification of nobles and princes neglects the wide range of his published writings and the outlets he used for them; the *Acta Eruditorum,* for example, and the liberal refugee journals in Holland hardly served to flatter courtly circles.

It is true, as Leibniz himself once admitted to Huygens, that he "tried always to accommodate (his) manner of speech to popular usage, *salva veritate*" (Sept. 4/14, 1694).[8] But he tried also to consider the diversity of his readers, and developed several terminological sets, the translation from any one of which to any other could be carried out, though not always without sacrifice in distinctness and adequacy. "There are two kinds of readers to whom I want to explain my principles," he said in the preface to a mathematical paper, "namely the tyro and the doctor." But there were in fact more kinds than two, all essential to his grandiose plans, and his own conception of the analogical and isomorphic structures of meaning supported his hope that the language of mathematics and

[7] Russell, *op. cit.,* 7.

[8] GM II, 193 f.

theology, of common sense and Scholasticism (whether medieval or Cartesian), would serve together to unfold parallel patterns of the same ultimate structure of being. That theology and logic distinguish the two philosophies of Leibniz, as Russell holds, is sufficiently refuted by the obvious fact that Leibniz intended his logical studies to serve as introductions to two much greater intellectual projects toward a united Europe—the universal encyclopedia and his great apologetic work, the *Catholic Demonstrations.*

Russell's particular refutation of the argument of the "good philosophy" is also too narrow in its premises. It is true that Leibniz repeatedly stated his conviction that the predicate is included in the subject, connotatively, in every true affirmative proposition, and that his exploratory logical studies aimed, but never succeeded, in relating this principle to many other things which he said about propositions. It is also true that for a few years from 1679 to 1687, the years ending in the correspondence with "the great Arnauld," he proposed what he called an "argument" from this logical principle to his theory of individual substance. It was not an argument, however, but the arbitrary imposition of a logical doctrine upon a metaphysical one. Nor was it carried over into his mature thought. It belongs to a time when he had just given up the effort to ground his union of essence and existence by means of the ontological argument, and before his dynamism had become explicit and his analysis of individuality complete. For the time being, Leibniz seems to have believed that this old Aristotelian-Scholastic theory of the proposition could be equated with the pluralistic but ambiguous Scholastic metaphysical doctrine that *modificationes sunt suppositorum,* which he usually quotes at the same time; he seems to have believed further that the more completely the method of analysis is applied to the reduction of propositions, whether universal and necessary or particular and contingent, the closer it will lead to complete or self-contained propositions whose subject is a determinate or complete concept, and whose predicates contain all of its essential and existential contents.[9] The logical completeness of the complex notion would assure its self-sufficiency, and the mutual restriction of many such complete notions would make inevitable the fulfilment of its predicates in temporal succession. This so-called argument is then generally held to have been buttressed by another Scholastic maxim

[9] Cf. Couturat OF, 403.

which Leibniz never abandoned, to the effect that "there are no purely extrinsic denominations," which is understood to mean that there are no external relations, in one or more of the many possible senses of that doctrine.

A brief examination suffices to show, however, that Leibniz did not base his theory of the individual upon so abstract an argument. It is true that he always regarded logical completeness or determinacy as essential to metaphysical substantiality. This became very obvious in the correspondence with De Volder, when the latter attempted, on purely logical grounds, and in anticipation of neo-realism, to make every essence and modification of Leibniz's substances into a substance; Leibniz refuted him on the very ground that such a purely logical analysis could not explain time and change.[10] Yet even in the early period of the *Discourse,* Leibniz must have admitted that there are complete notions that do not represent substances. In the *General Inquisitions* of the same year, a work in which he carried his logical analysis of metaphysics as far as he ever succeeded in doing, "the sword" is a complete notion, and is made no more complete by the addition of an "oblique" relationship, "the sword of Evander."[11] But neither of these logically complete terms is a substance in the metaphysical sense. The very examples, in fact, which Leibniz offered to Arnauld in support of his argument refute it, for the Adam whose "individual concept has involved that he should have so many children" (April 12, 1686), and the Alexander whose "individual notion" includes "for instance, that he will conquer Darius and Porus," and even "whether he died a natural death or by poisoning," do not involve single, metaphysical individuals but a great many.[12] It was not a single monad, however complex, which died of poison, or which begat the children of earth, but an harmonious interdependent series of a great many, which are capable, therefore, of further logical analysis and of many different syntheses.

Nor did Leibniz ever make a persistent effort to establish the possibility of a progression, by analysis and synthesis, from universal and particular propositions to a complete singular one, as his theory of the proposition would demand. It is true that he held that in both cases the stages would be infinite and therefore beyond

[10] Cf. the letter of July 6, 1701; G II, 226.

[11] Couturat OF, 357.

[12] G II, 15, 22, *et passim.*

the powers of creatures. But he was unable even to show the logical possibility of such an analysis. The *General Inquisitions* make it clear that the fundamental principle of subject-predicate inclusion is to be applied to most propositions only in a most qualified sense. It applies only to affirmative propositions. It applies to particular propositions only virtually, or in the sense that some genus can be found to which the particular subject belongs, and in which the predicate is contained. And it applies only to notions related *in recto,* that is, already involved in the relationship of identity of subject and total predicate. Leibniz makes only the most tentative efforts to reduce oblique relations, and relations represented rhetorically by the particles, to that of contained and container, but these very efforts show that he considered such analysis to be reductive of the complex relationships of being and existence rather than determinative of them; there are many kinds of relations in existence beyond that of the propositional form into which he sought to compress them in his calculus.

The fact seems to be that the further Leibniz tries to expand his logical principles into a symbolic treatment of all kinds of relations, the less conclusive they are for his metaphysics, and the greater the abstraction of the symbolic structures from a determinate order of existence. When he affirms that "there are no purely extrinsic denominations" he is neither affirming that all relations are internal nor that individuals are completely isolated from the world, but that the representations or symbolic expressions of external relations are built upon the analysis of internal mental qualities and symbols, the *materia prima* of the knowing mind.

Whatever his theory of the proposition may mean, Leibniz did in fact recognize the validity of relational propositions, in the realm both of possibility and of existence. He quoted Locke with approval to the effect that the largest field of our knowledge is the knowledge of relations, and pointed out, further, that his own system was developed by an analysis which discovers intermediate terms between the grosser relations in which experience begins.[13] An earlier example of such a gross relational proposition will serve to recall the principles according to which he held judgments of fact are to be analyzed and synthesized, and the relation of his theory of predicate-subject inclusion to this process. From the class of propositions dealing with essence and possibility alone, he distinguishes

[13] *Nouveaux Essais,* iv, iii, 18.

an entirely different kind, existential or contingent judgments whose truth can be understood *a priori* only by an infinite mind, and cannot be proved by any analysis. Such are the propositions which are true at a particular time, and express not merely what belongs to the possibility of a thing, but also what really exists, or what would exist under certain conditions. For example, that I am living now, or that the sun is shining. For if I say that the sun is shining at this hour in our hemisphere, because its motion has been such until the present, so that assuming the continuity of this motion, this truth follows certainly . . . yet this assumption that its motion was the same earlier is a contingent truth whose basis must be sought in its turn, and can be given only from a perfect insight into all parts of the universe. . . .[14]

"The sun is now shining in our hemisphere," like every other judgment of fact, and unlike every judgment of merely logical necessity, participates in two dimensions of being, and analysis and synthesis may proceed in each of these two dimensions. The first is the dimension of existence, which is bound to the continuity of time and space, and in which the relations are between the immediately apprehended particular qualities and symbols of the perceiving mind. Here the logical reference is denotative. The second dimension is that of essence or of logical possibility, where the reference is connotative, and it is this dimension of meaning that is the proper locus of Leibniz's logic of the proposition, and the general logic of analysis and combination to which it belongs.

The fullest development of this view is to be found in the correspondence with De Volder (1699–1706), where he makes clear the distinction among the predicates of every complete subject, between changing modifications and timeless essences, yet points out the dependence of essences upon existing events, so that every modification, that is, every momentary quality representative of an external order, may be considered in its essential dimension as a single term or a combination of terms.

You do not distinguish [he writes on January 21, 1704] between universal and particular natures. From universal natures there follow eternal consequences, from particular natures there follow also temporal ones, unless you think that temporal things have no cause.[15]

That the sun is shining implies that the essence of sun includes that of shining, in one case at least; thus existence includes possibility.

[14] Couturat OF, 18 f.

[15] G II, 263.

Such transition from existential to essential interpretation is possible, moreover, at any stage in the infinite temporal, spatial and causal analysis of which existence is capable, so that a structure of abstractness and of universality becomes increasingly available in the dimension of essence, as the analysis of existence proceeds. Facts can thus be analyzed existentially in terms of the events upon which they depend in occurrence, and essentially in terms of their possible composition out of simpler essences; in theological language, the mind has the power "to represent not only the world but also God in the world."[16]

The abstract principles of these two orders of analysis and synthesis are ultimately the same, but those of the existential analysis are more determinate. The analysis of existence is causal, and the principle of causality is the law of sufficient reason applied in the forms of spatial and temporal relation, that is, of simultaneity and succession. (This, of course, is an anticipation of Kant's schematism of the categories.) Similarly, the equivalence of forces in dynamics is a temporalized form of the law of identity. Causal analysis, therefore, may begin with any one of an infinite number of perceived facts of existence, and analyze it into its relations to significant antecedent and simultaneous states, as long as these are functionally related to it by the general harmony or congruence of existence. Leibniz believes that such causal analysis-synthesis, if our intellects were infinite, could pass from indistinct, phenomenal entities through the various formulas or structures of dependence until it arrives at the ultimate equations of functional dependence—the laws of the individual series, or monads. Since man cannot escape the blurred perceptions and sensuous limitations of his symbols, which are necessary to stop the continuous flow of events, as it were, and to hold the functional relations in suspense so that they may be analyzed, such ultimate analysis is humanly impossible.

But at every stage in this existential analysis, there is also possible an essential one, if the transformation be made from event or passing quality to permanent meaning. To do this is always to sacrifice the complete determinateness of existence, and to pass to the order of logical possibility and consistency, or in such formal fields as mathematics to logical necessity. This shift is necessary in order to pass from mere recurrence to true universalization; at certain stages of causal interpretation, therefore, one may use the

[16] To des Billettes, 1696; G VII, 452. God is "the region of ideas" or essences.

principles of identity, contradiction and sufficient reason to formulate universal natural laws. These "subordinate maxims," as Leibniz calls them in the *Discourse,* his favorite examples of which are the laws of optics and the law of the conservation of force, are in another dimension of meaning from the laws of the individual series; yet every individual law could, by an infinite mind, be transformed into essential laws or combinations of essences. So, for example, the law determining a human individual could be resolved into abstract but universal psychological rules (such as those of the association of ideas formulated in the *New Method for Teaching and Learning Jurisprudence,* 1666). From these laws a denotative application can be made, in turn, to particular facts of existence—and Leibniz believed further, that the concrete law of the individual is the combination of an adequate number of these abstract laws. The logical calculus, and with it the theory of subject-predicate inclusion, seems to be restricted entirely to this essential dimension. Except for a perfect mind, therefore, such a logic can never be entirely determinative of existence, for logical necessity constitutes existential possibility and no more; to move from existence to logic always involves a sacrifice in determinateness.

There remains, however, the problem of the law of the individual series or the individual concept. On what logical grounds could Leibniz affirm such laws, and regard them as the essential source of the continuous series of events which constitute an individual substance? The ultimate reason for this doctrine must be sought in his dogmatic identification of the simple notions to which essences can be analyzed, with the perfections of God. His only *a priori* proof of individuality is inseparable from the ontological argument, which he had already abandoned by 1679. This was an attempt to prove not only the existence of God, but individual existence as well, for it began, not merely with the idea of God but with the simple notions of the logical calculus, each one of which was assumed to be a simple perfection of God; to prove his existence becomes a matter of proving these perfections compatible. But as in mathematics a variable can be determined completely by enough functional conditions, so God too determines a combination of essences or simple notions so completely that they will coincide with the series of events in which the completest possible analysis and synthesis of existence results. Thus there is a logical identity between a completely determined combination of essences as sub-

jects and a serially complete order of temporal events or modifications as predicates—the law of the individual series.

But this argument failed when Leibniz discovered the gulf of negation and inconsistency which separates existence from logical possibility—a discovery which, his early criticisms of Spinoza and Descartes show, was made on moral grounds; it would be an evil world in which every possibility must ultimately attain existence.[17] With this failure to weld together "the old way of ideas" with a logic of existence, the keystone to his "system" is gone, though his faith in it remains; it is in this faith that the dogmatism of his thought must be found. Henceforth his argument for individual substances must be *a posteriori;* the "new way of ideas" can no longer be derived from the old, though he still seeks to develop it within the framework of the old.

The third point of reference for Leibniz's judgments of existence thus comes into prominence. The two dimensions of an existential proposition have been described as if they rested upon a theory of direct realism. But they do not; both the temporal relations of existing events and the combination of eternal meanings are in terms of the qualitative and symbolic content of the perceiving mind. Ratiocination, or the construction of symbolic formulas, whether in mechanics or in the logical calculus, is inseparable from representation. From his earliest years Leibniz was a phenomenalist, and propositions are never to be divorced from the qualitative content, the *materia prima* of the thinking mind. Indeed, it is this very symbolic quality of the proposition that makes possible the application of logic to continuously changing events; they must be held suspended in "momentary memory," as it were, in order to be analyzed. From this point of view, causality must be viewed as a merely abstract and descriptive synthesis of two observed occurrences which are really in functional dependence—the more distinctly grasped perception being taken for the cause, as Leibniz explained to Arnauld, and the less distinctly perceived as the effect. Now, too, natural laws cannot be considered as the subordinate maxims of God, but of man. Thus there emerges a further restriction upon Leibniz's general theory of the proposition. A completely analyzed proposition now states the equivalence of a symbolic formula with the structure of analyzed experience which it represents, and affirmative propositions

[17] G IV, 281, 283 f.

in which the predicate is included in the subject may be considered merely methodological devices for passing from symbols to the complex structure of meaning, and so of carrying the analysis and synthesis, the judgment and invention further. In addition to their existential and essential dimensions, therefore, in which propositions follow the coercive structure of reality, they also have a pragmatic function in making the formulas of science more adequate and in unfolding the complex patterns of symbolic analogies which bind the various sciences together. The dependence of propositions upon the symbolizing mind-monad is necessary to fit Leibniz's logic to continuous temporal change, and no other view will suffice to establish individuality; for it is only the momentary but cumulative memory of this representing and reasoning mind which makes it possible to arrest the flux of existence for the purpose of analyzing its organization, and which attests the enduring nature of individual substance. Essence is therefore no longer constitutive of existence but instrumental to its analysis and correction, and the rôle of propositions is to reveal and reduce the structure of existence to its possibilities.

With the failure of Leibniz's logical construction of his metaphysics, it is the empirical, or to use a currently popular label, the phenomenological pattern of his philosophy which comes into prominence. We may venture the opinion that his critics have not generally appreciated the magnitude of the change in emphasis which Leibniz's thought underwent in the 1690's, as the result of his dynamic physical notions and of the critical discussions evoked by his first hesitant publication of the *New System,* nearly a decade after he wrote the *Discourse.* It is not too much to say that questions of essence are now subordinated to the investigation of well-ordered phenomena and their essential and existential structures. As Professor Lovejoy has shown, the great chain of being is almost broken in the interest of time and progress. The most complete derivation of logical relations from individual substance is in the De Volder correspondence; but even in discussion with the Scholastic Des Bosses, his argument abandons the problem of relating essence and existence, to concern itself with an analysis of bodies and minds and to penetrate to a formula for their harmonious common activity. His system is repeatedly called an hypothesis, though as he writes to Lady Masham, it is the best of all available hypotheses and therefore has the presumption of truth.[18] Both his

[18] G III, 353.

mathematical analogies and his ultimate logical resolution have failed to establish an ultimate unity, and his philosophy appears more and more as the derivation of formulas in various fields of experience and their projection, by the discovery of analogous or isomorphic structures, into what he sought to establish as a single and harmonious order of being. But it is the noetic or "reflective" grasp of the mind's structure itself, with its unity of vitality and form, of active representation with passive content, that provides the analogy by which the grasped qualities and structures of the physical, mathematical, logical, and moral realms may be combined.

Yet Leibniz goes beyond phenomenology in refusing to restrict being to the qualitative and symbolic forms of experience, or to the general principles which analysis reveals within them. The real is the corrective and regulative ideal in experience—not an entirely other, independent of perception, but an incompletely grasped order of possibility involved in the various levels and forms of well-founded phenomena. Individuals are the requirement of existence rather than of essence, for our experiences are not only well-founded; they are representations, increasingly uniform as analysis and synthesis proceeds, of a reality that is itself only implied, but on which the scientific, moral, and religious possibilities of existence rest.

Leibniz's thought thus maintains a position midway between a nominalism in which logic is only indirectly relevant for existence and there is no universal basis for men's thought and plans, and a logical universalism in which the distinction between existence and possibility itself vanishes. In terms of the cultural conflicts of his own century, he sought for honorable men (the *homines honestatis* about which the literature of the century abounds) a basis for avoiding the "two sects of naturalism," absolutistic quietism on the one hand, and the libertinism which he feared threatened a European revolution on the other. Both logically and in terms of moral if not cultural purpose, he stood at Spinoza's side. Both sought to harmonize intellectual and moral needs; both emphasized, therefore, the ultimate unity of the scientific and the religious attitude, and sought a logic adequate to combine them. But Spinoza proceeded to identify the two, so that the intellectual love of God is both scientific integration and religious devotion, its result both universal scientism and a religion of renunciation. The very ethical motive of Leibniz's philosophy demanded a subordination of the

scientific investigation of existence to man's penetration into that harmonious order of values available in common, which depends on the disparity between existence and the realm of possible perfection, not yet achieved. The progress of his own thought was toward libertinage, but his demand for a source of universal meaning and universal compulsion held him to a logic of existence and one of possibility as well, with a gulf imperfectly bridged by human thought, but spanned by the creative powers of man's spirit. His own age rejected the universal; out of the victory of the libertine and his divisive projects have grown the crises of our own times. But good-will still requires, not merely warm feelings, but the perception of possible harmonies that are universal, yet capable of determinate existence. And to complete our inadequate perceptions and build these harmonies *in actu* demands, as Leibniz well saw, the perfection of common symbols, common law, and a common faith.

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LEIBNIZ'S GREATEST DISCOVERY

By Charles Hartshorne

Philosophical discoveries may be positive or negative. Thus Plato made a positive discovery when he characterized the soul as the self-moving, that is, the ultimate principle of change from which all change and motion must somehow derive (*Laws,* X); and Hume made a negative discovery when he pointed out that our observation of the external world yields no impression of causal connection or power. Hume claimed to have made the further negative discovery that observation of the stream of experiences as such—feelings, thoughts, and desires—is similarly barren of the impression in question, and this, if correct, would disprove Plato's positive statement, just as Hume's denial of power in the external world as observed tends to confirm Plato by indicating that there is no principle of motion in mere "matter" as such. I shall assume, without much discussion, the validity of Whitehead's criticism of Hume's negation of psychic power. What I wish to set forth is Leibniz's discovery of how to make Plato's point incomparably more fruitful and convincing than it would otherwise be.

Leibniz, of course, professed to affirm rather than deny, and if he made any negative discoveries it was in spite of himself. Thus his deductions from the principle of sufficient reason, making it yield such consequences as that this world is the best possible, or that the will is infallibly inclined yet with a purely moral rather than metaphysical necessity, amount, many would think, to a *reductio ad absurdum* of "sufficient reason," as understood.

But Leibniz made at least one superlative positive discovery of which he was fully conscious. This is his discovery that the element of truth in atomistic materialism is not only compatible with the truth of Plato's spiritual dynamics, but that the two truths may be fused so as to strengthen both. This discovery might, vaguely, be called that of spiritual atomism. But the phrase puts the emphasis in the wrong place. "Psychical microcosmic pluralism" is a more accurate designation. For the element of true discovery in ancient atomism was not the idea of an absolutely simple, indestructible little being (this was rather the element of fantasy) but was rather this: observed bodies as such

are a sort of composite perceptual photograph of numerous constituent entities *not a single one of which is ever observed as a distinct individual,* since it is in every case too "small," too slight a factor in our environment to register by itself upon our perceptual experience. Thus macroscopic behavior is merely a confused record of microscopic behavior; the microscopic world, though inferred from the macroscopic, nevertheless must be viewed as its explanation—rather than conversely. The ground of our knowledge is here precisely not the ground of being. If this seems a paradox, we should remember that some non-human type of knowledge might be able to have direct and distinct awareness of atoms (or electrons); and such a knowledge might be merely amused that we human beings imagined that the signs by which we know things are their basic characters and moving forces—as though, because we know physics chiefly through books and conversation, we were to suppose that the physical world is essentially bookish and loquacious.

However, there is one aspect of genuine paradox in atomism as sometimes conceived. If the microscopic is inferred from the macroscopic, then the categories by which we describe it must have *illustration* in the macroscopic data from which it is inferred. For without illustration *in principle,* concepts have no meaning. The "in principle" is important, for it means that the illustration may be widely different from that to which the concept is applied. If I experience two pains, one more "intense" than the other, cannot I then mean something by "a pain more intense than any I ever felt?" Similarly, if I know that bodies visible in some circumstances are invisible in others, and if I see one body to be much smaller than another, it seems I may have some grasp of what it would be for a body to be "smaller than any I can see." So far, atomism involves no paradox.

But paradox may arise when we try to make a complete list of categories which apply both to our experience and to that which is inferred from it. Observed bodies are all capable of being broken up; can the unobserved be unbreakable? What *observed* character would explain this? Leibniz has some splendid examples. If a solid body is one entity because its parts touch, then so is a pile of sand.[1] On the other hand, if the "solidity" is thought

[1] See the last few paragraphs of the seventeenth letter in the correspondence with Arnauld. This letter comes close to summing up the important points in the "discovery."

to be shown by the difficulty of tearing the thing to pieces, then we must remember that a chain of metal links may be just as hard to pull to pieces, and yet it is a plurality of links (which may not even touch each other), not a single entity. How can we have any conception of a thing literally just "one," and strictly incapable of disintegration? Nothing physically observed offers the slightest help here. If (to give my own examples, in the spirit of Leibniz) a mountain is, in a sense, one thing, why not the whole earth? On the other hand, if the earth is many things, why not a mountain? And if the mountain, why not a crumb? And indeed, why not an "atom," if this be something extended in space? And if it be not extended, then what analogy does it have to anything we observe? But if there is no analogy, what meaning does the idea have for us? Part of Leibniz's great "discovery," then, is his acute perception of the total *lack of illustration in experience* of certain atomistic categories, or alleged categories.

Another aspect of this same lack is in the idea that while in experience there are color qualities, and other "secondary" characteristics, "in reality there are only atoms and the void," the soundless, colorless, odorless causes of our sensations of quality. The atoms have size and shape, yet we never observe, it seems, a size or shape, save as the outline of some quality, some visual or tactual, or other allegedly secondary character. And apart from such character, spatial ideas are mere relational patterns—relating what?

We see then that atomism involves two negative characters paradoxically related to experience, the character of absolute indestructibility, and that of "relation *without* quality." No less paradoxical are the positive characters assigned to atoms. They move incessantly; yet nothing in the notion of "bits of stuff occupying space" suggests any impossibility in a complete absence of change or motion. (Concerning the modern view of space-time I shall say a word later.) The motions are approximately orderly; yet the implied partiality of stuff for order is based on no insight derivable from visual or tactual images of what "stuff" might mean. In modern science, at least, every atom takes account, as it were, of the positions of every other; yet we certainly neither see nor feel by touch any character of things that would make positively conceivable such a universal relationship of interdependence. In sum, atomism is required to explain the behavior, especially the chemical

behavior, of visual or tactual objects, but the concepts employed by atomism seem sheer riddles or paradoxes when interpreted through visual or tactual experiences alone. (Cf. Hume's discussion of physical causality, a discussion which made more explicit what Leibniz had already seen.)

We are now ready to consider the solution which Leibniz discovered for this problem. He reasoned substantially as follows. The principle that illustration must be found for all concepts does not mean that the illustration must come from those aspects of experience from which we infer the detailed facts to which the concepts are to be applied. (I can understand "he had on a blue suit" in a book even though the color blue does not appear in the book, provided I have blue sensation in some other aspect of my experience than the visual percepts of the book; and I can understand the word "pain" even though no pain *could* very well be printed on the page. Similarly, a visual percept can, through inference, yield the idea of certain individual realities, atoms, in a certain pattern, even though vision does not tell me what it is to be an individual.) After all, I infer the atoms to explain (or predict), not to describe, the (momentary) visual percepts; and though I cannot infer an explanation for which I have not illustrative foundation somewhere in my experience, there is not the slightest reason for requiring that this foundation be in direct *visual* experience, or even tactual. (Present knowledge of past vision is not vision, but memory.) Once it is admitted that vision is *universally* a highly blurred, or as Leibniz said, confused, report upon masses of invisible entities, it becomes illogical to look to vision for illustration of what is meant by individual entity! And touch is in the same case. It was the great oversight of materialistic atomists that they did not see this, but characterized the atoms as smaller editions of visible objects—except for the arbitrary subtraction of all non-structural properties and the arbitrary denial of composition and dissolubility. Leibniz is the first man to see with noonday clearness what the problem here is, and to take the logical step for dealing with it. The problem is, obviously, that of finding illustration for microscopic categories in macroscopic experiences *other than the visual and tactual.* For these latter, according to atomism, are *always* the perceptions of masses as such. Hence no illustration *could* be found in them of "individual as such." Could any logical point be much clearer?

Where then is illustration to be found? Surely not in smell or taste, for they are blurred, unindividuating sensations, if any such there be. We must forget about the five senses altogether at this point, and look to some experience which exhibits as *one* entity something that we have no reason to doubt really is one entity. Is not the self (at least at a given moment—though the importance of this restriction escaped Leibniz) one entity, if we know of any? Its unity is directly felt from within, not seen in a blur from a distance. By analogy we have the idea of the unity of other persons, of animals, and more vaguely, as a dubious possibility, of plants. Vision, it is true, tells us where in space such inwardly individual entities probably are; but it is not vision that directly presents their individuality. It is our own self-feeling that provides the necessary illustration for the analogical apperception of organic unity elsewhere. The observed physiological or behavioristic unity of others is merely a *sign* to us of the location of an instance of the category of individual reality. A machine could indefinitely approximate the observable unity, but yet lack entirely real individuality. And apart from that possibility, masses are still masses, however their members may skip about according to a pattern.

Leibniz's great step is now apparent. In order to find the meaning of individuality as such, therefore of individuality on every level, including the microscopic, he turned to those experiences in which there is both a vivid impression of individual reality and no indirect evidence to suggest that this impression is invalid. Evidence does indeed indicate that my body is a mass, not an individual. But my "self" is by that very fact shown not to be simply identical with my body. Obviously no evidence can show that I simply am my cells or my atoms. As Leibniz said, the most distinct perception conceivable of the physical structure of my body would only make more apparent that it is as little my experience, with its self-unity, as a factory is a mind. That I "depend" intimately upon my body is not to the point, for so does the body depend upon certain factors in the environment, without therefore being simply identical with the latter. The analogy is significant. "Environment" is that set of activities with which the activities of the given individual are most closely correlated. My individual self-activity, my flow of thought and feeling and purposes, is most closely correlated with activities of the parts of the body. So it is

not far-fetched to say that the body is merely the primary environment of the mind, and what is usually called "the environment" is (in relation to the self) the environment of the environment, the second envelope, so to speak, of correlated activities, correlated at one remove. Thus Leibniz generalizes, with a powerful sweep, the notion of correlation (he calls it pre-established harmony) to explain together the mind-body and the body-world relations. A body-mind is a system of individuals whose activities are correlated with those of one "dominant" member of the system which is the soul or mind of that body. Thus a soul is not an individual made of a different stuff from other individuals, but an individual with a privileged status in relation to a group of individuals. This status does involve a qualitative difference, but not that between "mind" and "matter" (since this could only mean, between an individual and a mass) but rather between high-grade and low-grade mind, between feelings illuminated by memory, foresight, and comparison, and feelings not so illuminated.

The venerable distinction between organic and inorganic matter yields easily to Leibnizian analysis. A system of correlated individuals may be correlated, as it were, democratically, without the pervasive influence of any one superior or dominant member. Then we have a body, a mass, without a soul. Or there may be such a dominant member. Then we have a besouled organism. The sign of the latter is a high degree of convergence of diversified activities, a high degree of "organic unity" of observable behavior and structure. But between the extreme cases of obvious convergence and obvious lack of it—a man and a pile of sand—there are intermediate ones, the moderately organic systems, where we can only guess as to the presence or absence of a ruling individual. Such a system is found, for example, in a tree. Here Leibniz was admirably cautious. He did not pretend to know (this being a question of fact, not of metaphysical necessity) if plants are sentient, besouled, organic systems, or not. He only maintained that on some level (or even, according to him, on an infinite regress of levels) there must, in the plant system, be a genuine individual or individuals, analogous to the only datum on which we can base an idea of individuality, our self-feeling. The analogy may be remote, but it must be genuine.

Of course, in one sense there is no system wholly without a dominant member, in whatever sense God is a member of every

system, as its supreme ruler. But God is not a member *localized* in one system rather than another; so at most he could be the soul of systems only as the soul of the cosmic system. And even this Leibniz does not dare affirm, so radical a break would it threaten with theological tradition.

I shall not undertake to point out all the respects in which Leibniz failed to keep the foregoing "discovery" unentangled with errors, partly old and partly original with him. I fear such entanglements were extensive. They had the result that the discovery itself became almost invisible as such to most of the learned world, concealed by the accompanying and more sensational, but in logic irrelevant, absurdities, such as the idea that there is an infinite regress of organism within organism, or that no soul is created save at the beginning of the world. These do not in the least follow from the mere idea of psychic microscopic pluralism.

One of the extravagances of Leibniz was his attempt to preserve for his monads the absolute indestructibility attributed to atoms. If visual experience discloses no illustration of such a property, neither does self-feeling—save in one sense only. We can, by analogical extension of the continuity of personality through memory and purpose, conceive an ideally persistent and powerful, and therefore indestructible, self, i.e., God, the sole completely indestructible or all-persistent individual. Apart from God, there is no theoretical need for such absolute persistence. The need is for real individuals now. Thus it cannot be that a pile of sand is simply a group of molecules and these simply groups of atoms and these simply groups of particles, and these—? Something must be grouped besides just groups! Self-feeling is the only illustrative basis in our experience for a solution to this problem. But there is no necessity that the units grouped have always been there and always will be. Only the subject-predicate view of substance,[2] which makes creation of new units or the death of old a logical riddle (for of what subject can the coming to be or passing away of a subject be a predicate?) explains Leibniz's denial of "natural" beginning or termination of monads.

Particularly unfortunate was it that Leibniz was unable to carry through his great doctrine of the relativity of space and time. Let us briefly consider why.

[2] Cf. Whitehead, Part III of *Adventures of Ideas;* or *Process and Reality, passim.*

It will be recalled that the illustrative problem involved the questions of quality as requisite to structure, and of indivisible units as requisite to extended masses. The former question is easily dealt with by Leibniz, since of course feeling or perception always has its quality, and thus every monad is internally characterized. The only difficulty is to determine in what sense the monads admit of the spatial relations essential to extension. Extended matter as we observe it is a mass of individuals; it is groups that extend over a visible area. *Given location for the members, the groups will have size and shape,* in terms of the distances and directions in which the members lie in relation to each other. It may, however, be thought that this does not evade the dilemma we pointed out for atoms, that either the monads individually occupy space or they are mere points, and if the former they must be groups of individuals after all, while if the latter, they are mere geometrical abstractions. This was Kant's argument in his second antinomy. But it is not unanswerable. For it is not geometrical extension alone that forced science to suppose that macroscopic bodies are groups. It was the inability to predict behavior on any other basis. Extension, to be sure, makes it always *conceivable* that what seems a single continuous entity is really a number of entities with individual outlines and gaps blurred together in our perceptions; but extension alone perhaps does not make this necessarily a fact. What does make it a patent fact is that behavior fits into a pattern only on the micropluralistic interpretation. Moreover, physical observation discloses no principle of *dynamical* unity by which we can express, not only the fact that a certain body is *here* now, but the fact that it *will* be *over there* later on. Motion, as observed, is not inherent in the quality or shape that a thing is observed to have at a given moment, but is a sheer addition to them. Only in the flow of experiences is there an observed relation of present to past and future. This relation Leibniz calls appetition. It is desire, and (where thought intervenes) purpose, that point to the future, and the reverse reading of this pointing gives us the past as immanent in the present. A lump of matter is indifferent to where it goes, or has come from, so far as any visual or tactual image of matter we can form is concerned. Nor, Leibniz urges, can the Cartesians meet the difficulty by arguing that motion is itself given in the present as an indestructible quantity inherent in the moving thing as such. For one thing, the true law

of motion is not that the amount of motion is constant, since it is the square of motion that yields a law, and this square of motion is not just the motion itself as observed or as now actual. It is as though the thing could mentally multiply and then be guided by the result of this operation. It has a dynamical yet orderly destiny in *addition* to its present state, if that state is conceived in images drawn from vision. But if psychic conceptions are employed, such as that of appetition, then the present state *is* a sense of destiny and a striving, a "force," to achieve it. The thing follows a (Newtonian) pattern of motion because it enjoys the beauty of this pattern, perhaps in a blind way of thoughtless desire, but still as influenced by this beauty. What does pattern mean to mere stuff?

Of course, one can describe the physical thing as a world line in the four dimensions of space-time, but this is only a statement of the problem. There is the mere geometry of four-dimensional structure, a mere relational type, and there is the assertion that "something" real has this structure. This something real needs quality as well as structure. Also, we infer the past and future only from data in the present, and this presupposes a principle according to which the present *as given* implicates its origin and destiny; and only because it is assumed that this principle has been provided can we talk about space-time or the world system.

Thus the situation is that visual images give us patches of color that tell no tales of origin and destiny, and are proved by experiences of dissolution to exhibit no other unity than that which could be possessed by masses of units individually too insignificant, in proportion to our concerns, to be perceived distinctly as units by us. In the experience of self-feeling, on the contrary, we have a vivid sense of individual unity. Discard this sense as illusory along with the visual unities, and nothing is left to give the idea of illusion its essential complement of veridical perception.

The foregoing argument makes no use of the geometrical divisibility of space except as implying that there *may* be smaller constituent units and that the seemingly given unit *may* be a group. The may is converted to must (in the manner we have sketched) by other aspects than that of mere extension. Therefore the psychic microscopic monads need not necessarily correspond to mere points.

Leibniz did not, however, attain a clear doctrine on the nature

of space; partly for the very good reason that while he sees space as a relational scheme, his Aristotelian theory of substance as subject with private predicates makes the status of relations as such ambiguous at best. If A is related to B (for example, if A perceives B), then, since relation to B is nothing without B, if A really has this relation as its property, then it also has B as element in this property and therefore as element of itself, and thus substances become members one of another. Leibniz as an Aristotelian, in logic and theory of individuality, cannot take this step, so relations are neither properties of substances (which thus "have no windows"), nor can they be substances on their own, for him. What are relations then? They are, it seems, properties of God's mind as he contemplates the monads. This is as near as one can come to an answer, and it seems to mean, as Russell has urged, that either the monads are internal to God—pantheism—or God is subject to illusion; and so is Leibniz himself, in continually speaking as though the coexistence, that is, relation, of the monads were a fact.

Another weakness, not logically inherent in the "discovery," is in the temporal structure of monads. Leibniz holds that the self-unity of feeling which is the illustrative basis of the idea of individual reality must be supposed to be a unity of past and future states such that all that ever has qualified and all that ever can qualify the monad qualifies it now. The natural question occurs: what then is the difference between past, present, and future, if at any time the same total set of predicates qualifies the monad? This bizarre paradox arises because of traditional, especially Aristotelian, presuppositions not usually so sharply formulated. The individual is "substance," substance is what is the same through change—the thing which changes from state *a* of *itself* to state *b* of *itself*. Now there is a confusion here between two meanings of individual selfhood. In a certain logical sense, "individual" is what is concrete and determinate, rather than abstract, or admitting of further determination. The subject-complete-with-all-its-predicates is the individual in this sense. But the thing which continues to exist through change of states of itself is quite another matter. This "changing" subject is never complete or fully determinate until it ceases to endure through change—until it is dead in fact. The predicational completeness is present and retrospective only, never prospective. Leibniz was trying to

identify the predicationally complete with the individual as having a future, whereas the latter is essentially incomplete, with an element of indeterminacy or generality or abstractness. Here Aristotle, though more confused, was wiser than Leibniz in his clarity. (Only Whitehead, in my opinion, has attained both wisdom and clarity on this point.)

The rather general refusal to accept the "discovery" of Leibniz has been due, apparently, to one of the following reasons: failure to grasp clearly the question (concerning the illustrative basis of the atomism so necessary to science) to which it is the uniquely appropriate answer; failure to distinguish, as Leibniz himself largely failed to do, between the discovery and various ideas whose association with it was an accident of Leibniz's mind rather than any requirement of logic; inability to endure the rebuke to sluggish imaginations which is implied in the doctrine that the merest lump of dust contains myriads of centers of feeling; the difficulty of giving clear definition to the posited analogy between the human subject and other entities; and finally, the realization that, as Leibniz himself admitted, scientific investigation seems to have no need of a complete answer to the "illustrative" question, and no use to make of it. The value of the doctrine seems philosophical not scientific (though it is hazardous to speak for the future of science) in that it enables us to clarify our fundamental categories in a uniquely satisfying manner, and thus gives us a firm foundation for metaphysics, natural theology, and ethics. In this technological age there is likely to be contempt for any doctrine which claims no technological applications. If a man does not wish to understand the meaning and rationally estimate the truth of such ideas as God, freedom, the good, to see how "mind" and "matter," or how atom and man and God, go together to make a world, he may have no need for the "discovery." But if he has such a wish, he cannot afford to neglect psychical micropluralism. It is a generalization quite comparable in sweep to the calculus (which in any case was co-discovered by Newton), and unlike the calculus is no mere technical device but a description, seemingly without meaningful alternative, of the basic structure of the world as composed of individuals.

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LEIBNIZ'S THEORY OF SPACE*

By F. S. C. Northrop

Aside from the appropriateness of this celebration of Leibniz' birth, many contemporary developments make a consideration of his theory of space of considerable importance. Perhaps most significant is that physics has recently rejected with Einstein Newton's absolute space and replaced it with a relational theory. It is well-known that even in Newton's time Leibniz argued for such a theory. Hence the question of the degree to which Leibniz' relational theory corresponds to the contemporary one merits special inquiry.

But Leibniz' theory of space is important for other reasons. Perhaps no doctrine in his entire scientific and philosophical outlook cuts as deeply to the heart of his position, indicating both its strength and its weaknesses, and its relation to that of previous and subsequent modern scientists and philosophers.

Also, Leibniz' theory of space can be best understood, and in fact only understood properly, if it is conceived as one of the possible answers to the basic epistemological and metaphysical problem to which the replacement of the medieval Aristotelian philosophy of science by the modern theory of science gave rise. That Leibniz' theory of space does have its essential setting in the historical treatment of the initial problems of modern science and philosophy is shown by the exposition of his theory of space in his *New Essays on the Human Understanding;* here he discusses his entire epistemological and metaphysical position in its relation to the in part similar but for the most part radically different doctrine of Locke's famous *Essay.* It will be well, therefore, to begin with this basic epistemological and metaphysical problem raised by the acceptance of modern science and its attendant philosophy, first noting how Leibniz' theory of space appears as a consequence of one of the answers to this problem, and coming afterward to his explicit conception of space and the deeper analysis of its precise meaning.

There were two channels through which the scientific and philosophical thought of modern minds expressed itself initially as it moved from the problems arising from modern science to the possi-

* Read at the meeting in commemoration of the tercentenary of Leibniz held by the Fullerton Club at Bryn Mawr College, May 11, 1946.

ble answers to these problems. These two channels of expression appeared because modern science was first formulated by Descartes and then a little later by Newton.

To be sure, the Newtonian formulation soon triumphed over the Cartesian one. Nonetheless, Leibniz stands primarily in the Cartesian tradition, whereas Locke, especially in his theory of space in its relation to matter, stands in the Newtonian one. We shall see that Leibniz never escaped from some of the assumptions of Cartesian science. But also, Locke, because of his lack of expertness in mathematics compared to Leibniz, and because of the theory of ideas to which modern physics as explicitly formulated by Galilei and Newton gave rise, never fully appreciated the epistemological requirements of the mathematical character of space as conceived by Galilei and Newton. Not until the *Tractatus Logico-Philosophicus* of Ludwig Wittgenstein in our own century—and it is doubtful if even now—was it at all possible for anyone intimately acquainted with the concepts of mathematics and mathematical physics to suppose that either the primitive ideas or the basic postulates of these sciences could be understood without recourse to the rationalists' *a priori* rather than merely the British empiricists' *a posteriori* theory of ideas.

THE CARTESIAN BACKGROUND

Leibniz tells us[1] that he "was almost persuaded of" the theory of matter in its relation to space which was later maintained by Newton and Locke and defended by Clarke in the latter's exchanges with Leibniz. The Newtonian and Lockean theory affirms that space is an infinitely extended absolute entity quite independent of matter, in all its essential logical and mathematical properties. Thus this absolute space would exist even if all matter were removed. Matter, on the other hand, is located within this space and occupies a relatively small portion of it. It is to be noted that this position is identical with the one affirmed in Greek times by the atomists Democritus and Leucippus.

Even though the majority of later Greek and medieval scientists rejected this Democritean theory, with its void or extension independent of matter, for the theories of space of Plato or of Aristotle, there was nonetheless throughout the Middle Ages a small group

[1] *Reflections on Locke's Essay* (1696); *Philosophical Works of Leibnitz*, trans. by G. M. Duncan, 96.

of thinkers who still defended it against the generally accepted scientific theory of space. Gassendi and his associates were the latest representatives of this position. It is likely, therefore, that it was this minority group which first interested Leibniz in this theory of space. In fact, Leibniz explicitly refers to Gassendi and his colleagues in connection with his reference to the theory.

Two conditions in the state of the scientific mind immediately previous to the time of Leibniz would have naturally tended to cause him to reject Gassendi's theory. First, the medieval Aristotelian view was opposed to it. Prime matter, according to Aristotle, embraced everything and space was the extension of this prime matter. Hence the notion of a substance which is space, which is void of matter in considerable part, would have been quite foreign to the traditional medieval science. Secondly, the first conception of modern science to replace the Aristotelian conception was that of Descartes. He made spatial extension the defining property of matter. Thus by definition wherever there was space there had to be matter. Hence again the Democritean conception of the relation between matter and space, later reaffirmed by Newton and Locke, was ruled out by the generally accepted scientific viewpoint of the time.

It was not until Newton's *Principia* had been published, and its superiority over the Cartesian physics with respect to the laws governing planetary motion had been established, that the Newtonian and Lockean conception of the relation between matter and space became the generally accepted scientific one. But by this time, as Leibniz' published papers clearly demonstrate, Leibniz had already reached his final position upon the matter—a position which abandons Democritus and Gassendi for the Cartesian rejection of a void or empty space, while at the same time, because of other considerations having to do with the difficulties concerning interaction in the Cartesian philosophy, rejecting the Cartesian conception of space as the defining characteristic of a material substance. In other words, Leibniz arrived at his final theory of space in its relation to matter, a theory which rejects the Democritean and Newtonian conception of a vacuum, at a time when such a denial of the void or empty space was the generally accepted conception of both the medieval Aristotelians and the modern Cartesians, and before the evidence brought forward by Galilei and triumphantly established by Newton had had its chance to produce its effects.

This means that Leibniz' statement that at first he seriously considered the Newtonian and Lockean type of theory of the relation between space and matter, while true, is not quite as convincing as it first appears to be. For at the early date when he felt this sympathy for the Democritean theory, the general weight of scientific opinion was opposed to it; and when Newton's *Principia* later swung the weight of scientific opinion back to the Democritean theory, Leibniz' mind, guided by quite different considerations, was already fixed.

Nevertheless, there was one consequence of the Newtonian physics, a consequence which came out very clearly in the philosophy of Locke, which supported Leibniz in the conception of the relation between space and matter at which he had arrived before Newton's physics had established itself. This consequence has its basis in an epistemological distinction between nature as sensed and nature as scientifically conceived in the mathematically formulated and experimentally verified physics of Galilei and Newton. The importance of this distinction in modern science will be appreciated if we note the contrast between the physics of Aristotle and the physics of Galilei and Newton upon this point.

Aristotle, affirming a theory of ideas which, as Leibniz notes,[2] is not unlike that of Locke, to the effect that there are no ideas in the intellect which are not first in the senses, defined the different kinds of material substances in terms of immediately sensed qualities. This had the consequence of making his physics and chemistry largely qualitative. Thus by the chemical material "fire" Aristotle meant any immediately sensed extension of matter which is sensed as hot and dry. Hence, in the Aristotelian physics the immediately sensed qualities of things were the defining properties of physical objects and belonged intrinsically and essentially by scientific definition to the objects themselves in accordance with the prima facie deliverance of our senses.

Galilei, the founder of the modern physics of Newton, completely rejects this Aristotelian notion. Anticipating the later kinetic theory of heat and gases, he affirms that none of the sensed qualities which material objects seem to possess belong to the objects themselves; they have nothing whatever to do with the scientific definition or conception of these objects, but are instead mere

[2] "His [Locke's system] bears more relation to Aristotle, mine to Plato." *New Essays on the Human Understanding, Philosophical Writings,* Everyman ed., 142.

appearances which, "were the observer removed," would completely vanish and be nothing but "mere names."[3] The material object itself, on the other hand, with which modern Galilean and Newtonian physics is concerned, does exist independently of the presence of the observer and has certain properties quite other than those which are sensed. These properties are impenetrability, geometrical shape, and so forth. In fact, it was Galilei who first drew the distinction between primary and secondary qualities which became so familiar through Locke's philosophy. The primary qualities are not sensed, being the geometrical properties of atoms too small for the senses to detect. The secondary qualities which are sensed are mere appearances relative to the observer, and they presuppose the presence and awareness of the observer for their own existence.

Newton carries this distinction between nature as sensed and nature as scientifically conceived one step farther. Not only is there the distinction between the sensed secondary qualities which are mere appearances and the primary qualities belonging to the veridical objects of scientific knowledge, but also there is a similar distinction between the sensed space and time in which the sensed secondary qualities appear and the quite different postulated mathematically defined space and time in which the unseen masses and atoms of physics are located. Thus Newton at the very beginning of his *Principia* warns his readers against "certain prejudices" of "the common people" which result in the confusion of the space and time of mathematical physics with sensed space and time. To avoid this confusion, Newton introduces the adjectives "sensed, relative, and apparent" to designate the latter and "mathematical, absolute, and true" to designate the former.[4]

Furthermore, not only are mathematical space and time absolute, public, and the same for one observer as for another, whereas sensed space and time, like sensed qualities, are relative, private and mere appearances differing from one person to another. The physical masses or objects of the science of dynamics are meaningless when considered by themselves and require for their scientific definition and their existence the otherwise empty public absolute space in which they are located. In other words, according to Newton, while space can exist without matter, a material object

[3] See E. A. Burtt, *Metaphysical Foundations of Modern Physical Science*, 73–80.

[4] Newton's *Principia*, Cajori ed., 6.

cannot exist without space conceived as a container within which it is located. This point also Newton makes very explicit in the first Scholium at the very beginning of his *Principia:* "All things are placed in time as to order of succession; and in space as to order of situation. It is from their essence or nature that they are places." The word "essence" in this statement refers to the Aristotelian predicables involved in the definition of anything. To say that it is of the essence or nature of a physical mass that it has position in absolute public space is to assert that position in such a space is part of the definition of what a Galilean and Newtonian physicist means by an individual physical object. This, it must be emphasized, is the heart of the concept both of a physical object and of its relation to space as conceived by Galilei's and Newton's physics.

At no point do the Newtonian and Lockean theory and the theory of Leibniz come into more unequivocal conflict. What the Newtonian definition asserts is that individual physical masses have their individuality defined by their location in space. This violates both of Leibniz' basic metaphysical premises, (1) the principle of the identity of indiscernibles and (2) the principle of sufficient reason. Since Newton's space has similar topological and Euclidean metrical properties everywhere, it is homogeneous. Thus it has no qualitative differences to distinguish one part of it from another. Hence the particular parts of Newton's space violate the Leibnizean principle of the identity of indiscernibles. Similarly, a physical object becomes an individual for Newton merely by having a unique position in this homogeneous space. This permits the Newtonian physics to have physical masses or atoms which are completely identical in every one of their intrinsic properties. Thus the difference between one atom and another, that is, the individuality of each atom, is accounted for purely in terms of position in homogeneous space. Such intrinsically (i.e., qualitatively) identical individuals also violate Leibniz' metaphysical principle of the identity of indiscernibles.

Furthermore, the location of the mass particles at certain points in absolute space rather than others is quite arbitrary. Such a conception taken as a basic premise of physics thus violates the Leibnizean metaphysical principle of sufficient reason.

Let us set these considerations to one side for a moment and pursue further the distinction in Galilean and Newtonian physics

between nature as sensed and nature as conceived in a mathematically formulated experimentally verified theory. Nature as sensed, including both sensuous qualities and sensed space and time, is mere appearance, relative and varying from one observer to another; nature as mathematically and scientifically conceived is a collection of mass particles, often qualitatively identical, deriving their individuality from their location in public mathematical space, and the same for everyone, existing independently of the presence of the observer.

The question immediately arises: what is the relation between the sensed qualities in sensed space and time and the individual mass particles in mathematical space and time? It is no exaggeration to say that most of modern philosophy is an attempt to answer this question. Certainly this is unequivocally true of all modern philosophy up to and including Kant, as it is true also of the recent philosophy of Alfred North Whitehead.

The British empirical philosophers took over the answer to this question given by Galilei and Newton. Both of these physicists said that the sensed qualities in sensed space and time are the mere private subjective appearances to the observer of the material mass particles with their primary qualities in real mathematical public space and time. Put more technically and precisely, this is equivalent to saying that sensed nature is related to scientifically conceived nature by a three-termed relation of appearance, in which the mass particles in mathematical space and time are the first term, the individual observer is the second term, and the subjectively sensed qualities in sensed space and time projected as appearances are the third term.

It is to be noted that with respect to the relation between sensuous qualities and material substances the Cartesian science and philosophy and the physics of Galilei and Newton are in agreement. Both theories conceive of the sensuous qualities of the sensed world as the mere subjectively apprehended and projected appearances resulting from the action of the material substances of physics upon the observer.

Once this is admitted, a second question inevitably arises: what is the nature of the observer who functions as the second term in this three-termed relation of appearance? In the case of Descartes, because of his rationalistic method with its argument based upon the *cogito ergo sum*, this question was already answered, since he

was assured of the existence of the self or observer as a mental substance before he became aware of the validity of the belief in external material objects. But in the case of the British empiricists such as Hobbes or Locke, no such criterion of the nature of the observer in the three-termed relation of appearance was at hand. They had nothing upon which to go but the prescription of Galilei's and Newton's physics itself. What did this physics indicate concerning the nature of the observer?

Hobbes was the first in the British empirical tradition to attempt to answer this question. Impressed by the scientific evidence for the existence of material substances as conceived by the physics of Galilei, he hit on the obvious hypothesis that the observer is an aggregate of material substances just like the aggregate of material substances in the external object at which the observer is looking. The evidence in support of the Hobbesian hypothesis is considerable, and has increased with the centuries. Physics, chemistry and physiological chemistry have indicated that observers, at least in their bodily nature, are constituted of the same atoms of physics which Galilei and Newton found in the material objects other than the observer. Furthermore, the dependence of one's introspective moods and intellectual capacities upon the chemical constitution of one's body and the physical state of one's nervous system has been verified again and again and again.

Nevertheless, the Hobbesian hypothesis will not do, as both Locke and Leibniz saw. This becomes evident the moment one proceeds to pursue the conception of an observer conceived as nothing but the material substances of Galilei's and Newton's physics, to its logical consequences. Then it becomes evident that upon the basis of the Hobbesian hypothesis sensuous qualities and their sensed spatial and temporal relations should not exist even as appearances. For, as Galilei specified, these sensed qualities are not properties of the material substances. In fact, the latter substances are entirely bereft of such properties. Consequently, all that could happen when an external object which is an aggregate of material substances acts upon an observer who is nothing but a similar aggregate of such substances, is the effect prescribed by Newton's second law of motion; namely, the atoms of the observer's body should merely undergo certain accelerations. Clearly, the acceleration of the non-sensuous atoms of the observer's body occurring in public mathematical space and time is not an awareness of sensuous

qualities in sensed space and time as appearances. Thus, on the Hobbesian hypothesis that the observer is nothing but an aggregate of Newtonian mass particles in mathematical space and time, the actually observed sensuous qualities in sensed space and time should not exist even as the appearances which Galilei and Newton affirm them to be. In short, the Hobbesian theory is quite incompatible with the requirements of the Galilean and Newtonian distinction between sensed nature and scientifically conceived nature.

Locke saw the point and drew the only possible conclusion, once the three-termed relation of appearance is admitted: The observer must be the kind of an entity which can function as the second term in this three-termed relation. In other words, the observer is an entity such that when the mass particles in mathematical space of Galilei's and Newton's physics act upon it, it has a private subjective awareness of sensuous qualities in sensed space and time as appearances. This is precisely what Locke meant by a mental substance. Thus, whereas Descartes, because of his rationalistic method, started his philosophy with the concept of mental substance whose defining property was the deductive rationalistic process of thinking, coming to the belief in material objects afterward, Locke, starting with the empirically verified theory of Galilei's and Newton's physics with its distinction between material substances in mathematical space and time and sensed qualities in sensed space and time as appearances, had the belief in material substances first and from this Newtonian concept of the material substance in its three-termed relation to sensuous qualities, deduced his concept of mental substance.

It is precisely in these differences in method and presupposed scientific background that the distinction between a mental substance as conceived by Descartes and a mental substance as conceived by Locke consists. For Descartes, because of his rationalistic method, deductive rationalistic thinking with the innate ideas which it presupposes as premisses, is the defining property of a mental substance. For Locke, on the other hand, reasoning from the empirically verified physics of Galilei and Newton, a mental substance is merely an entity which satisfies the three-termed relation of appearance joining material substances to sensuous qualities, which was prescribed by the founders of that physics. Consequently, the defining property of a Lockean mental substance is not deductive rationalistic thought with its innate ideas, but the receptivity to the action of the material substances.

Since such a mental substance has no content in its awareness until the material substance acts upon it, it is in itself a blank tablet and consequently brings to experience no innate ideas. Furthermore, since the sole effect of the action of a material substance on the observer is to produce a specific atomic sense datum or an association of such atomic sense data, the only meanings which a Lockean mental substance can ever have in mind are the nominalistic particulars and their particular associations built out of such atomic sense data. Hence the nominalism of the Lockean theory of ideas. Note also how this corresponds exactly with what Galilei, long before Locke, said modern physics indicates sensed factors to be, namely, "mere names."

From this theory of ideas Berkeley's conception of the material object and Hume's conception of the self follow necessarily, and the Lockean concepts of material substances and mental substances become meaningless. In other words, the Galilean, Newtonian and Lockean theory of material substances acting on mental substances to cause the latter to project sensuous qualities in sensed space and time as appearances is self-contradictory. The theory entails a theory of ideas which renders its basic assumption of mental and material substances meaningless. Need one wonder that Leibniz reflected at great length upon Locke's *Essay* and was never persuaded to move back to the Democritean theory of the relation between matter and space, notwithstanding the support of the latter position which came with the triumph of Newton's physics?

This conclusion was supported by a second consideration, which appears when the theory of Galilei, Newton and Locke is pursued to its logical consequences in another direction. The question immediately arises: How can the notion of a material substance acting on a mental substance be conceived in a manner which is not self-contradictory and meaningless? With respect to this question Leibniz' position in the philosophical movement termed Continental Rationalism, stemming from Descartes by way of Malebranche, combined with his reflections upon the philosophy of Locke. Notwithstanding their differences in method, in their theory of ideas and in their conceptions of the nature of a mental substance, Descartes and Locke nonetheless agreed that the relation between body and mind and the processes of knowledge involve an interaction between mental and material substances. Even before Locke the followers of Descartes, in particular Malebranche, had perceived the insuperable difficulty in this conception.

Material substances, regardless of whether one conceives them in Cartesian or Newtonian terms, are by definition in space, and hence they can act only in space. Mental substances, on the other hand, whether Cartesian or Lockean, are not in space; instead, for a mental substance, space is a portion of the interior content of its consciousness. This is precisely what Leibniz gave expression to when he described mental substances as "windowless." An entity has a window or windows when it has an inside and an outside. But this is possible only for entities in space. Hence, mental substances, not being in space, are windowless.

But once it is noted that a mental substance is an entity not in space, and that a material substance is by definition an entity which is in space, then it becomes evident that the action of a material substance on a mental substance is impossible. For certainly an entity which is of such a nature that it can act only in space can never be in contact with an entity which is not in space.

Need one wonder, therefore, that Leibniz tells us in one of his earlier papers that he found himself forced to reject *any* theory of interaction between substances? Even though Berkeley's reflections upon the consequences of Locke's philosophy and the difficulty in the Lockean and Cartesian theory of interaction between mental and material substances were not available in Leibniz' time, Leibniz nonetheless saw that the Berkeleian type of attempt to get out of the difficulty by having the interaction occur solely between mental substances was equally untenable; the reason being that since mental substances are by their nature and definition not in space, the relation of otherness, outsideness and separateness necessary to make interaction meaningful cannot be present. In short, the notion of a mental substance conceived as an entity not in space and the notion of interaction between substances are contradictory concepts. Thus, Leibniz tells us that when he "came to meditate on the union of the soul and the body [he] found no way of explaining how the body can cause anything to pass into the soul, or *vice versa;* nor how one substance can communicate with another created substance."[5]

Leibniz' solution of this difficulty in terms of his doctrine of pre-established harmony is so well-known that it need not concern us in itself. Its importance for our purposes is to be found in the way in which it determines Leibniz' doctrine of space.

[5] *A New System of Nature; Philosophical Works of Leibnitz,* G. M. Duncan trans., 76.

The heart of the doctrine of pre-established harmony consists in the realization that the dualist theory of mental and material substances must be rejected. Assuming the validity of the concept of substance, as did all modern thinkers before Hume, one had therefore to choose between a conception of reality in terms of nothing but material substances or in terms of nothing but mental substances. The previously noted failure of the Hobbesian attempt to account for knowledge in terms of nothing but material substances left Leibniz, as it left Berkeley, with no alternative but to attempt to derive knowledge from nothing but mental substances. Once the inadequacy of the interaction theory in any form becomes evident, the doctrine of pre-established harmony follows. All the content of an observer's knowledge is the projection of the creative activity of the observer himself, unconditioned by any external action upon the mental substance of Newton's material substances or of Berkeley's God. Hence the thesis that force or activity, rather than extension or passive receptivity, is the defining property of a real substance. Hence also the vanishing of the Galilean, Newtonian and Lockean distinction between mathematically conceived space and time and sensed space and time. The only space and time which can exist and have meaning are the space and time within the subjectively projected content of consciousness of the observer. Since this observer is now active rather than passive, and since it contains within itself the whole of reality as known, Leibniz calls it a monad; and since space is within the content of its consciousness rather than an absolute independent substance or continuum within which the monad is located, this observer or monad is windowless.

But to deny that space is either the extension of material substance or an absolute substance within which real entities are located, is to reject both the Cartesian and the Newtonian theory of space. This is the negative portion of the Leibnizian theory of space. For its positive content one must look within the content of consciousness of the active observer or monad itself. Here clearly space is neither a substance within which other substances are located nor is it an attribute of a substance; instead, space can be identified only with the relatedness of the items of one's immediate consciousness. Hence Leibniz' relational theory of space.

As he put it in his correspondence with Clarke: "Space is nothing other than an order of the existence of things which is observed

when they exist simultaneously.'"[6] Note that this makes space not merely relational but also a relation between things which are observed. Note also the use of the temporal concept of simultaneity to distinguish the relatedness between phenomena which is spatial from the relatedness which is temporal. The similarity of this position with that of Professor Whitehead in his *Concept of Nature*[7] is also not to be overlooked. In his *New Essays on Human Understanding* Leibniz adds that "space is an order."[8]

One might suppose that this renders the Leibnizian theory of space completely clear. This is not the case, however, until one has also become aware of Leibniz' theory of relations in general and his theory of the relations with which mathematics, or more particularly arithmetic and geometry, are concerned. To this end two things are required: one, an examination of his theory of relations as indicated in his chapter on relations in the *New Essays;* the other his epistemological theory of the foundations of mathematical knowledge. The latter appears also in the *New Essays* in Leibniz' designation of his agreement and disagreement with the Lockean theory of ideas.

I am especially indebted to Dr. Kurt Gödel for directing my attention to the importance of Leibniz' theory of relations. If his particular position upon this point is not grasped one will fall into the error of supposing that his doctrine of relations and of space is identical with that of recent mathematicians and logicians.

The recent modern theory takes relations and their formal properties as primitive concepts in logical and mathematical theory. For Leibniz, however, the reverse is the case. The properties of relations derive from the intrinsic predicates of the terms which they relate. As he puts it in the *New Essays:* "Every substantial being, be it soul or body, has its relation to every other substantial thing, which is peculiar to itself; and one must always differ from another by *intrinsic denominations.*"[9]

This, it is to be noted, is tied up with the Leibnizian metaphysical postulate of the identity of indiscernibles. Leibniz defines the principle of the identity of indiscernibles as follows: "There is no substance which has not something to distinguish it from any other substance."[10] Thus it is from the intrinsic differences of the

[6] *Correspondence with Clarke,* in *Philosophical Writings,* Everyman ed., 215.
[7] P. 53. [8] Duncan trans., 327.
[9] Everyman ed., 172. [10] *Ibid.*

substances that the relations between the substances derive. At another place in the *New Essays* Leibniz writes: "By virtue of insensible variations, two individual things can never be perfectly alike . . . and they must always differ more than *numero*. This at once puts out of court . . . a substance without action, the void in space, atoms and even particles not actually divided in matter, absolute rest, complete uniformity in one part of time, place, or matter."[11]

Moreover, strictly speaking, for Leibniz relations are not given purely empirically. Instead, they are the logical implications of the differing properties of their end-terms, which are given empirically. Moreover, each observer or monad infers these relations and orders only because of the *a priori* or innate ideas in the intellect of the observer which do not originate there empirically. It is with these innate ideas that Leibniz in part at least identifies God. Thus he writes again in the *New Essays:* "Relations and orders are most certainly entities of reason, although they have their foundation in things; for it may be said that their reality, like that of eternal truths and possibilities, comes from the supreme reason."[12] Earlier in the same volume he writes: "It is best then to say that space is an order, but that God is its source." Moreover "its truth or reality is founded in God."[13] To make Leibniz' meaning upon this point clear it is necessary to examine his epistemology.

THE LEIBNIZIAN EPISTEMOLOGY

In 1696, in connection with his earliest *Reflections upon Locke's Essay,* Leibniz expressed his opinion concerning the importance of an epistemological investigation into the foundations of knowledge as follows: "Of all researches, there is none more important, because it is the key to all the others."[14] In approaching such an inquiry Leibniz asserted that one must take but two things for granted: (1) experience, and (2) the axiom of identity, or its equivalent, the principle of contradiction.

Experience, Leibniz asserts, gives us knowledge of the existence of the self. Thus he writes: "It is very true that we know our own

[11] *Ibid.,* 152.

[12] Duncan trans., 341. See also *Neue Abhandlungen über den menschlichen Verstand,* tr. by Ernst Cassirer (Leipzig, 1915), 236–238.

[13] Duncan trans., 327.

[14] *Ibid.,* 94.

existence by an immediate intuition.''[15] This suggests that one's own self, instead of being a logical deduction from the experience of doubting, is an immediate item of experience itself, knowable without an appeal to formal logic. This conclusion seems to be required by the definition of intuition which Leibniz gives in his *New Essays on the Human Understanding.* There he writes: ''Knowledge is intuitive when the mind perceives the agreement or disagreement of two ideas immediately by themselves, without the intervention of any other.''[16] Forthwith Leibniz proceeds to designate two ''primary truths of intuition'': (1) truths of reason, and (2) primary truths of fact. The former type of truths exhibit themselves in what Leibniz terms ''identical propositions'' which ''do nothing but repeat the same thing,'' being true because they are tautological, grounded in ''the axiom of identity, or, what is the same thing, contradiction.''[17] Such propositions, Leibniz adds, are the basis of the proofs of logic. Furthermore, it is in such propositions that mathematics, i.e., geometry and arithmetic, have their basis. Thus propositions referring to the self do not fall under truths of reason.

Instead, knowledge of the self falls, according to Leibniz, under primary truths of fact. Such a truth is defined as one having its basis in ''the immediate internal experience of an immediacy of sensation.''[18] It is clear that Leibniz did not have the advantage Kant enjoyed of passing through Hume's inquiry concerning the conception of the self to which one would be restricted, were the self identified with nothing but what is given in the immediacy of sensation. Certainly, as Hume made clear with a decisiveness which even Kant accepted, the concept of the self as a substance preserving identity is no more guaranteed by the immediacy of experience than is the concept of an external material object. Thus it must be maintained that if, as Leibniz affirmed,[19] Descartes took too much for granted in approaching an epistemological inquiry into the foundations of knowledge, Leibniz has done so also.

The reason for Leibniz' acceptance of the existence of a substantial self as a ''primary truth of fact'' guaranteed by intuition

[15] Duncan trans., 98.
[16] *New Essays,* Everyman ed., 181.
[17] *Ibid.,* 182.
[18] *Ibid.,* 185.
[19] Duncan tr., 94.

with immediacy is, however, easy to understand. Before Leibniz had read Locke's *Essay* and had come, in his reflections upon it, to the articulation of his own theory of ideas, he had faced the problem of interaction between substances, rendered inescapable by Descartes' as well as Locke's philosophy, and had arrived at his solution, in the terms of the doctrine of pre-established harmony. This doctrine requires the active self as the source of everything one experiences. Thus, in his *Reflections on Locke's Essay,* Leibniz writes that "not only our ideas but also our feelings spring from within our own soul," as do also our ideas "even of sensible things."[20] And in *The New System of Nature* he affirms, that "every spirit, being a spirit world sufficient to itself, independent of every other creature, enclosing the infinite, expressing the universe, is as durable and as stable and as absolute as the universal creature itself."[21]

Hence, for Leibniz not merely the spatial-temporal form of experience, its spatial-temporal order or relatedness, arises completely within the active ego or monad, but also the empirical data functioning as the end-terms in this relatedness have a similar origin. And precisely because the relatedness is not a substance within which any other substance, material or mental, is located, but is instead entirely within the content of consciousness of the windowless monad, no alternative remains but to regard space as purely relational, having as the terms of its relatedness the phenomena of consciousness.

This in turn has the consequence of making matter as known by any scientific knower or observer purely phenomenal. It is for this reason that Leibniz can speak in physics of literal interaction between material substances, meaning thereby actual interaction rather than an interaction which has to be analyzed into the agreements set up by God between different monads by means of the pre-established harmony. Leibniz' point here is that material substances, being merely phenomenal, are not real substances in his sense of "real substantial [i.e., formal] unities."[22] Thus in his *Reflections on Locke's Essay* he writes: "The action of one substance on another is not the emission or transmission of an entity as is commonly believed, and cannot be understood reasonably ex-

[20] *Ibid.*

[21] Duncan tr., 79.

[22] Duncan, 76.

cept in the way which I have just mentioned [i.e., pre-established harmony]. It is true that we can easily conceive both emissions and receptions of matter by means of which we are right in explaining the mechanical phenomena of physics; but as the material mass is not a substance it is apparent that action as regards substance itself can only be what I have just said.''[23]

Leibniz' theory of space can now be summarized in part. Space is the relatedness of phenomenal matter within the content of consciousness of the individual monad. There is no spatial relation between material objects conceived, as Leibniz sometimes conceived them, as dull monads, since monads are not in space.

Once this is recognized part of the conflict between Leibniz and Newton with respect to the nature of space vanishes. For the only space which Leibniz has is the private relational space joining sense data, or phenomenal matter, and even for Newton, as indicated previously, sensed space is relative. It is in rejecting the absolute mathematical space which Newton affirmed in addition to relative sensed space, that Leibniz differs from Newton.

But even with respect to Newton's distinction between sensed space and mathematical space there is not as much difference between Newton and Leibniz as at first appears. For Leibniz was an expert mathematician and mathematical physicist in his own right, and this expertness made him as aware as was Newton that the space of mathematical physics is not sensed.

Upon this point Leibniz is unequivocal. To begin with, the notions of angles, lines, etc., given through the senses are entirely too blurred and fuzzy to serve as the technical spatial concepts of mathematical physics. ''The fact,'' he writes in the *New Essays,* ''that we have the angles of the triangle in the imagination does not mean that we therefore have clear ideas of them. Imagination is incapable of proyiding us with an image common to acute-angled and obtuse-angled triangles, and yet the idea of a triangle is common to both. Thus this idea does not consist in the images, and it is not as easy as one might think fundamentally to understand the angles of a triangle.''[24] In fact, this understanding can come only by a logical analysis which determines the elementary undefined concepts and logical operations in terms of which the combined ideas can be rigorously defined, and upon the basis of which

[23] Duncan, 80.

[24] Everyman ed., 191.

the remainder of the subject can be logically deduced. For these basic primitive concepts of geometry and arithmetic the data of sense, as Leibniz saw, are not adequate.[25]

Also, as Ernst Cassirer[26] has recently emphasized, space for Leibniz is not merely the relatedness of the phenomenal content of one's own actual immediate experience but also the relatedness of the content of any possible experience. This conception of it as referring to the possible as well as the actual made it ideal in a second sense. Furthermore, knowledge of space is a different kind of knowledge from the knowledge of the empirical phenomenal data which constitute the end-terms of the spatial relatedness. Although space is the relatedness of phenomenal matter, and this phenomenal matter is given through the senses, nevertheless, space itself is not given through the senses. The reason for this conclusion is to be found in Leibniz' theory of relations, noted previously.

Since relations are not, for Leibniz, given empirically with empirical sensuous immediacy, but are, instead, logical inferences from the differing predicates possessed by their end-terms, knowledge of space depends not merely upon the deliverances of sense awareness given with immediacy but also upon rational logical deductions from this immediacy. Consequently space is not known by brute creatures but is known only by beings who possess the capacity to know truths of reason as well as primary truths of empirical fact.

These truths of reason Leibniz holds to be not given empirically. They are innate. They are also not contingent as are truths of fact but necessary.

Put more concretely, this means that space cannot be known merely by sense awareness, as are the differing predicates of phenomenal material things which sense awareness gives, but requires in addition the logically related deductively formulated system of ideas of Euclid's geometry with its distinction between primitive concepts and defined concepts and between postulates and logically demonstrated theorems which presuppose the truths of reason, i.e., of logic, grounded in the principle of identity and its law of contradiction. These primitive ideas which are universals rather than sensuous particulars, and these primitive logical propositions, requisite to demonstrate the connections between the ideas, which

[25] *Ibid.*, 181–191.

[26] Ernst Cassirer, "Newton and Leibniz," *Phil. Rev.* (July, 1943).

are tautologies, are not given empirically but are innate. Thus Leibniz in the *New Essays,* when he specifies the innate ideas which he defends against Locke, finds the support of his defense in "the propositions of arithmetic and geometry, which are all of that nature [innate]; and as regards necessary truths, it is not possible to find any others."[27]

Also, these innate ideas, as is shown by the rigor with which logical proofs can be carried through in terms of them, have a clarity and a distinctness which the confused ideas of sensation do not possess. Having this perfection, they are identified by Leibniz with the divine. Thus he writes of ideas in the *New Essays* that "distinct ideas are a representation of God and confused ideas are a representation of the universe."[28]

There is a second reason for identifying the innate ideas, exhibiting themselves in the demonstrable knowledge of geometry and arithmetic, with the divine. Leibniz, like Berkeley, must account for the belief in a public world which is in some sense the same for everyone. If matter and space are merely the empirical terms and their relatedness of the inner content of consciousnss of an individual monad, there can be no such public common world unless the spatial and temporal order and the ideas or meanings involved in the definition of this order are the same for all monads. This similarity is guaranteed only by God. Thus in this second sense the innate ideas exhibiting themselves in geometry and arithmetic are "representative of God."

It is the systematic space grounded in the innate ideas representative of God which, when determined by logical analysis, defines the invariant space common to the differing perspectives of the different monads Hence it is not by sense awareness but by logical analysis and the systematic logical deductions of reason that one achieves the concept of a single public world. Furthermore, it is in the capacity to be linked up in a single consistent system by this ideally and relatively known space, rather than in vivacity, that the distinction between sensed objects which are veridical and those which are illusory has its basis. As Leibniz writes in the *New Essays:* "The true criterion regarding the objects of the senses is the connection between phenomena, that is to say the linking up of what occurs in different places and times, and in the experience of

[27] Everyman ed., 168.

[28] *Ibid.,* 172.

different men, who are themselves very important phenomena to one another in this regard. And the connection of phenomena, which guarantees *truths of fact* with regard to sensible things outside us, is verified by means of *truths of reason;* as appearances and optics have light thrown upon them by geometry."[29]

The complete meaning of the Leibnizian theory of space is now evident. Space is the relatedness of the phenomenal content of one's consciousness. It is, however, a formal theoretically known ideal relatedness rather than an empirically sensed relatedness. Consequently, even though it is entailed by the immediately sensed phenomenal matter which it relates, it nonetheless is not known by sensation. Instead, it can be known only by reason, by a reason, moreover, having its roots in ideas which are not given in images, which are not particulars but universals, and which because of their perfect clarity and hence perfection, and the publicity which they give to human knowledge of the universe, have their roots not in the mind of the individual monad but in God.

Expressed in terms of Galilei and Newton's distinction between sensed phenomenal matter in relative sensed space and time, and external physical objects in unsensed mathematical space and time, what Leibniz did was to combine the sensed end-terms of the former with the relatedness of the latter. Thus for Leibniz space was the relatedness of the phenomenal material content of the observer's or monad's consciousness, and relative to that individual monad. The end-terms of the relatedness were given empirically; the spatial relatedness of the end-terms was not given empirically, instead it was known only by reason and was ideal.

That this theory has much in common with that of Kant is obvious. Both affirm that space is not given empirically but is known theoretically by means of ideas brought by the knower to the empirical data of knowledge. Nevertheless there are radical differences between the Leibnizian and the Kantian theories. This shows in the fact that Kant, who first believed the Leibnizian relational theory of space, came later to reject it.[30]

These differences will sharpen our conception of the Leibnizian theory. In the first place, there is a difference with respect to the origin of the phenomenal content to which the order of space is

[29] *Ibid.*, 190–191.

[30] See "Natural Science and the Critical Philosophy of Kant," in *The Heritage of Kant,* edited by G. T. Whitney and D. F. Bowers (Princeton, 1939).

applied. For Leibniz, not merely the ideal order or form of space but also the sensuous phenomenal matter which is the content of this spatial form originates in the knower. This, it is to be noted, is necessary because Leibniz rejects any knowledge coming from without the self and thereby requiring an interaction theory. It was precisely this non-egocentric source of the empirical data which kept the unknowable *Ding an sich* hovering like a ghost in the background of the Kantian epistemology. But if for Kant the terms or empirical content in the spatial relatedness have one source and the order or forms of space and time have another, then the relatedness of space and time cannot be, as it was for Leibniz, logically implicit in the empirical content. In short, the relational theory of space must be rejected. Hence, Kant's affirmation of the absolute rather than the Leibnizian relational theory of space and time.

Actually, however, Kant's reasoning proceeded in the opposite direction. First convinced by reading Leibniz of the validity of the relational theory of space, Kant tells us that later Euler convinced him that Newton's first law of motion, because of its requirement of a meaning for the motion of the solitary mass, necessitates the doctrine of absolute space.[31] This follows, it is to be noted, because on a relational theory there is no meaning to space or to motion unless there are at least two masses to serve as the end-terms of the relation. Kant also found, in the purely geometrical fact of "incongruent counterparts," exhibited in the case of two otherwise similar right and left hands, a second proof for Newton's absolute theory of space. Assuming a world of only three dimensions, this proof also is valid. Kant became convinced in addition of the validity of Newton's contention that rotational motion calls for an absolute rather than a relational theory of space. Thus Kant was led by scientific considerations to his epistemological theory that the forms of mathematical space and time of physics are quite independent of the phenomenal empirical content which they order.

Consequently, space was not rooted objectively in phenomenal matter for Kant as it was for Leibniz. Things were in space and time for Kant because the scientific observer as knower was so constituted that he could experience the empirical data which came to him from an origin other than himself, only under the forms of sensibility of space and time. Thus there was no logical connection between the phenomenal material content given through the

[31] *Ibid.*

senses, and the spatial or temporal relatedness with respect to which this content was ordered.

For Leibniz, on the other hand, such a logical connection existed, since all relations for him were merely the logical implication of the different predicates of the entities which were their end-terms. Thus, space was as objective and intrinsic to phenomenal things known *a posteriori* as were the sensuous predicates of the phenomenal things themselves. What were *a priori* were merely the primitive ideas and the principles of logic necessary to enable a finite mind to derive the spatial order, which, although unsensed, was there intrinsically in the phenomenal things.[32]

What of the present validity of the Leibnizian theory of space? The foregoing analysis makes it clear that it has very little in common with the relational theory of space required by the contemporary physics of relativity of Einstein.

Although both Leibniz and Einstein hold a relational theory of space, it is merely to the relatedness of phenomenal, immediately sensed matter that the Leibnizian relational theory of space refers. Even for Newton this sensed space was relational rather than absolute, as the portion of the Scholium at the beginning of his *Principia,* quoted above, unequivocally testifies.

What Einstein has done is to preserve the Newtonian distinction between relative sensed space and time and mathematical space and time. This follows from Einstein's refusal to identify the simultaneity of spatially separated events in nature with immediately apprehended simultaneity.[33] It is precisely at this point that Einstein's and the contemporary physicists' concept of simultaneity differs from that affirmed in the present-day philosophy of Alfred North Whitehead, which, as was noted above, is identical in its definition of a relational theory of space with the definition laid down by Leibniz, according to which spatial order is distinguished from temporal order in terms of the immediately perceived simultaneity of spatially separated events. What has happened in Einstein's theory of relativity is not, as so many people have supposed, that Newton's distinction between phenomenal, sensed space and theo-

[32] See also Johannes Pitschel, *Leibnizens und Kants Lehre vom Raum miteinander Verglichen* (Leipzig, 1905).

[33] Albert Einstein, *The Theory of Relativity* (London, 1921), 21–24. See also J. H. Thirring, *The Ideas of Einstein's Theory* (London, 1922), 40–44; and especially A. D'Abro, *The Evolution of Scientific Thought* (New York, 1927), Ch. XV.

retically conceived, postulated mathematical space has been removed, so that space in physics becomes identified with relative sensed space. Instead, even postulated, indirectly verified mathematical space as related to different physical frames of reference is relational in character.

Since Leibniz' relational theory, like Professor Whitehead's contemporary relational theory and even like Kant's absolute theory, fails to distinguish the order of sensed space from the order of mathematical space in the manner required by Einstein's theory of relativity, the advance of contemporary physics to a relational theory of mathematical space can no more be interpreted as a confirmation of the relational theory of space of Leibniz than of the absolute theory of Kant. What has happened in contemporary science is that the Galilean and Newtonian distinction between phenomenal, sensuous matter in sensed space and time, and mathematically postulated, indirectly verified matter in mathematical space and time has been retained. The novelty of the advance made by Einstein consists in the fact that even the postulated mathematical space and time, when considered with respect to different physical frames of reference, is now shown to be relational.

From this it follows that the problems in modern scientific and philosophical epistemology can be resolved neither by the empirical Lockean or Humean, nor by the rationalistic Leibnizian or the Kantian epistemologies. None of these epistemologies provides the different orders of space necessary to account for the Galilean and Newtonian distinction, maintained by Einstein and contemporary physicists, between sensed space and time and indirectly verified, public, mathematically defined space and time. This distinction at one stroke destroys the Kantian epistemology, because it shows that it is not merely possible but also required that the human mind conceive of two quite different orders of space and time, the sensuous order and the theoretically known, mathematically defined order. Thus the Kantian thesis that the mind can order things spatially-temporally in only one way is invalid, as is also the Leibnizian theory that the phenomenal data, because of the relational theory of phenomenal space, logically imply this one order.

The Humean epistemology is equally inadequate for the same reason. Even if one admits, as Leibniz and Kant deny, that there is a spatial-temporal relatedness given purely empirically and not

brought to the empirical data by means of *a priori* ideas or forms, this sensed spatial and temporal relatedness is still the relatedness of sensed space and time, and not the relatedness of the physicists' public mathematical space and time. Thus, while the Humean epistemology is quite correct for sensed space and time, it is quite impotent with respect to the scientists' mathematical space and time.

Leibniz and Kant, like Descartes, because of their expert mathematical knowledge saw quite correctly that it is with mathematical space and time that science is primarily concerned. They saw also that the concepts and the method of knowing their relatedness are not those given empirically. Thereupon a false use of the principle of parsimony led them to attempt to combine the phenomenal matter of sensed space and time with the structure of mathematical space and time, thereby muddling two different worlds of discourse and obtaining an incomplete and in part erroneous theory of each.

But if the epistemologies of both the British Empiricists and the Continental Rationalists including Kant, are inadequate, what direction, then, must an adequate epistemology take in the philosophy of contemporary science? It must start with all the types of knowledge and all the distinctions between sensed space and time and mathematically defined, indirectly verified space and time which the theories of contemporary physics prescribe. Our epistemology of scientific knowledge must be fitted to the character and the distinctions within that knowledge as specified by the physicists.

But this is easier to say than to do, for all the great modern epistemologists came to their theories by pursuing certain elements in the knowledge of modern physics to their logical consequences. Somewhere, probably back at the very beginning, a mistake was made. Otherwise the epistemological philosophies at which these thinkers arrived would not have turned out to be so partial and inadequate with respect to the scientific theory from which they were derived. There are reasons for believing that this error occurred at the very beginning of modern science and philosophy, when Galilei and Newton, after making the correct required distinction between sensed data in sensed space and time and scientific objects in mathematical space and time, went on to affirm that the former are the mere appearance of the latter. Once this is assumed, all the inescapable problems and difficulties and alternative and inadequate epistemologies which constitute the history of modern

philosophy follow. These considerations suggest that a solution may be found by re-examining the relation in scientific theory and knowledge between sensed and theoretically designated factors. Elsewhere this has been done.[34]

Here it is appropriate to conclude with an appraisal of our indebtedness to Leibniz. Even though his relational theory of space is not the one prescribed by Einstein's physics, he does make evident the type of relational theory of space to which a phenomenological theory of matter leads one. He also demonstrates that an adequate knowledge of mathematical, scientific space involves an appeal (1) to ideas with a clarity which ideas referring to sense data do not possess, and (2) to propositions capable of logical connections and demonstrations depending upon the tautological propositions of logic, which an epistemology grounded solely in a Lockean theory of ideas can never give. This is the reason why Leibniz stands at the beginning of one of the richest and most creative movements in the history of western mathematics, and why he is regarded by everybody, including even the positivistic followers of Hume, as the initiator of modern mathematical logic.

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[34] See the writer's *The Meeting of East and West* (New York, 1946), Ch. XII.

LEIBNIZ'S ATTACK ON THE CARTESIAN DOCTRINE OF EXTENSION*

By John W. Nason

For the author of the *Monadology*[1] extension and all its modes—size, figure, and motion—were unreal. "The Monad, of which we shall here speak, is nothing but a *simple* substance, which enters into compounds. By 'simple' is meant 'without parts.' And there must be simple substances, since there are compounds; for a compound is nothing but a collection or *aggregatum* of simple things. Now where there are not parts, there can be neither extension nor form nor divisibility. These Monads are the real atoms of nature and, in a word, the elements of things."[2] The common sense world of space and of objects in space was for Leibniz at its worst a contradictory, illusory product of the imagination and at its best a set of *phenomena bene fundata*. The same argument applies to time. Spatial and temporal objects have their laws which it is the business of natural science to investigate, but as spatial and temporal they are not ultimately, i.e., metaphysically real.

This was Leibniz's final position. It was not, however, his initial one. In his youth he was strongly attracted to the "reformed philosophy." For some ten or fifteen years his thinking moved largely within the Cartesian setting. It would hardly be accurate to call him a "good" Cartesian,[3] but his writings in this

* Portions of this paper were read at the meeting in celebration of the tercentenary of Leibniz held by the Conference on Methods in Philosophy and the Sciences at the New School for Social Research, New York City, May 5, 1946.

[1] Throughout this article the following abbreviations are used:

G.—Gerhardt: *Die philosophischen Schriften von Gottfried Wilhelm Leibniz* (7 volumes).

L.—Langley's translation of the *New Essays concerning Human Understanding.*

C.—Couturat: *Opuscules et fragments inédits de Leibniz.*

D.—Duncan: *Philosophical Works of Leibnitz.*

M.—Montgomery: *Leibniz' Discourse on Metaphysics.*

B&C.—Buchenau und Cassirer: G. W. Leibniz, *Philosophische Werke* (4 volumes).

N.E.—*Nouveaux Essais.*

[2] *Monadology*, Secs. 1–3.

[3] From the very beginning Leibniz showed the eclectic spirit which characterizes all of his philosophy. Note his early attempt to harmonize Aristotle and Descartes. While he wrote to Thomasius in 1669 that he was "anything but a Cartesian," that in fact he approved of more things in Aristotle's *Physics* than in Descartes' *Medita-*

early period contain so many of Descartes' doctrines that it is not misleading to speak of a Cartesian period. His treatment of the basic Cartesian notion of extension constitutes an instructive illustration of the way in which he arrived at his independent philosophical convictions.

Fortunately we have a letter, written in 1669 to Thomasius when Leibniz was twenty-three years old, in which he outlines his early philosophic position.[4] The predominance of Cartesian doctrines is striking. Extension is both real in itself and important in explaining natural phenomena. Primary matter consists of extension together with *antitypia* or impenetrability. Matter, whatever other qualities it may possess, is extended, i.e., it is quantitative and continuous. The diversity of particular things is produced by motion. Rest is admitted. Space or extension is considered as a substance. Motion, which is not deducible from extension, is due to the action of intelligence, and that means in the final analysis to God. Similar doctrines are to be found in the essay, *Confessio Naturae contra Atheistas,*[5] written in the same year, and in a fragment, dated 1671.[6]

At the same time these documents contain suggestions of non-Cartesian doctrines which gradually develop into the anti-Cartesian position that Leibniz had adopted in fairly complete form by 1686. Leibniz's early training in and unwavering allegiance to Aristotle and the schoolmen were in part responsible for his insistence on the scholastic doctrine of substantial forms. While he admitted the reality of extension, he denied that it is the essence of matter or substance, giving as his reasons the impossibility of explaining the properties of matter in terms of extension and the impossibility of accounting for the Christian doctrine of the Eucharist in terms of Descartes' *res extensa.* Further, in the fragment dated 1671, he reversed his position of two years previous, denying that there can be such a thing as rest, or at least asserting that matter at rest is not real.

The strength of the Cartesian influence is nowhere more striking than in a letter to Claude Perrault, member of the Paris Acad-

tions (G. I, 16; Langley, 634), the fact remains that a strong Cartesian influence dominated this period of his thought.

[4] This is given in G. I, 15–27 and translated by Langley, 631–51; a slightly different version is given in G. IV, 162–74.

[5] G. IV, 105–10. [6] G. VII, 259–60; Langley, 651–2.

emy of Sciences, with whom Leibniz was in touch during his stay in Paris. In this letter, written according to Gerhardt in 1674 or 1675, Leibniz concludes with so complete an affirmation of the Cartesian doctrine that the laws of motion and of corporeal phenomena are ultimately susceptible of a purely geometrical explanation, that I give his words in full.

> A long chain of exact and geometrical reasoning, however, would be necessary to deal with this problem fairly. Nevertheless, I believe that it is within our power, and that we have enough phenomenal data for a rigorous analysis and deduction of the true constitution of this sublunary system. If anyone would devote himself to this, he would find that in the end the whole difficulty is one of the solution of problems in pure geometry; just as I believe that I can at present satisfy the laws of motion by purely geometrical demonstrations which involve neither assumptions nor empirical principles. We shall ultimately be able to treat this subject purely in terms of mathematics and geometry. Thus I think that we are at present in a position to hope for a true and non-hypothetical physics. If one were to combine my slight skill in geometry plus the method of general analysis, which I have now used for some time and by means of which, once the phenomenal data are given, one can proceed by strict geometrical arguments and without recourse to guessing—if one were to combine these with the meditations of people like yourself who are so well acquainted with the details of physics, I should dare to hope that we might arrive at something really useful for our age. As it is, we are still ignorant, as I noted above, of many matters which would be within our power if we only reasoned with sufficient vigor; and if we continue in our present fashion in the investigation of nature, posterity alone will profit from our pains.[7]

On the other hand, Leibniz had begun to realize by 1676 the difficulties latent in what is conventionally known as "the problem of the continuum."[8] The purely geometrical account of motion prophesied in the letter to Perrault presupposes the continua of extension, duration, and motion. In *Pacidius Philalethi* Leibniz discusses the apparent contradictions involved in the notion of a spatial continuum in a way that foreshadows the universe of monads in which space and time are creatures of reason without real basis in the actual world. I do not know what brought about this change. Leibniz's typical doctrine of force, with which he

[7] *Archiv für Geschichte der Philosophie*, I, 574–5.

[8] Cf. the extremely important dialogue, *Pacidius Philalethi*, written on shipboard as Leibniz was crossing from England to Holland. It is given in Couturat, 594–627.

opposed the Cartesian laws of motion, does not appear in either writing. Indeed, its first mention, so far as I am aware, is in 1686. Unfortunately we have relatively few letters from Leibniz during the period from 1676 to 1686. What few there are indicate clearly that he was becoming more and more critical of Cartesianism, but they throw more light on his reasons for dissent than on the positive grounds for his own constructive position. By 1686, however, many of the important features of Leibniz's philosophy had become fixed. He was then forty. In the *Discourse on Metaphysics* written at this time and in the renewed correspondence with Arnauld we can see in truth that Leibniz was "anything but a Cartesian." Extension was no longer treated as real. The Cartesians were accused of wrongly assuming that it is a simple, primitive notion when in fact it is complex, derivative, and relative. Leibniz had never held that extension was sufficient in itself to explain corporeal phenomena, but from this time on he drove his argument home with illustration after illustration of its inadequacy. In short, as Leibniz made clear in the *Discourse,* extension and all its modes are imaginary.

I have thus far been tracing the evolution of Leibniz's views on the subject of extension. I have sought to show that, while never a disciple in the usual sense of the term, he was nevertheless strongly influenced by various Cartesian tenets as late as 1674 or 1675 when he desiderated a purely geometrical explanation of motion; that he was moving definitely away from Cartesianism by 1676; and that, so far as the doctrine of extension is concerned, he had arrived in substance at his final view by 1686. I shall now turn to a consideration of the arguments by which Leibniz sought to combat the Cartesian doctrine of *res extensa* and by which he advanced his own position. These arguments are not sufficient in themselves to establish a doctrine of monads, but they are clearly instrumental in the development of such a doctrine, and they are necessary to it in the sense that any such doctrine would be impossible if there were not valid grounds for rejecting extension and space as purely phenomenal. Leibniz's detailed discussion of this problem falls into five arguments and a conclusion. I shall call these (A) the argument from transubstantiation, (B) the inadequacy of extension in explaining phenomena, (C) the argument from individuality, (D) the argument from the principle of plenitude, (E) the argument from complexity and relativity. These

lead to the conclusion (F) that extension and extended objects are unreal.

(A) *The argument from transubstantiation.* Around 1669 Leibniz became acquainted with the Baron von Boineburg, a man of profound religious piety, who was instrumental in his entering the service of the Elector and Archbishop of Mainz. Both patrons were concerned with the reunion of the Catholic and Protestant faiths and with the problems of Christian theology. Having a lively interest in such questions and a natural aptitude for them, Leibniz entered whole-heartedly into their plans. One of his earliest attacks on the Cartesian doctrine of extension as the essence of corporeal substance arose from his preoccupation with the theological problem of the Eucharist. How can the visible bread and wine be the actual body and blood of Christ, as the Church asserted it to be? In particular, as Leibniz remarks in a letter to Arnauld (1671), how can one substance, namely Christ's body, be in many different places at the same time and under different species, i.e., as bread and as wine?[9] This is the "mystery of the Eucharist" which Leibniz set himself to explain. He was clear from the beginning that a rational explanation would need a different basis from anything provided by the Cartesian doctrine of *res extensa*. This is an important question for those who take seriously the traditional Christian faith. However modified and diluted the views of modern Protestant liberalism, it is important today for all Roman Catholics and many Fundamentalists. Traditionally it has been the cardinal article in the Christian faith, being the one occasion of direct communion with God. Thus Thomas Aquinas speaks of it as "the consummation of the spiritual life."[10] In the theological atmosphere of the 17th century it was highly important that any philosophy make possible this "mystery," and Leibniz could legitimately use the Cartesian failure on this point as constituting a charge of atheism against Cartesianism.

In order to understand Leibniz's treatment of the problem it is necessary to trace the development of the doctrine. In the early period of the Middle Ages the Christian view had wavered between the purely spiritual interpretation of the Eucharist defended by Augustine, and the quite literal, almost materialistic interpretation, one of the chief exponents of which was Ambrose. According

[9] G. I, 75.

[10] *Summa Theologica*, III, Q.73, A.3.

to the Thomist synthesis in the *Summa Theologica* and the official position of the Roman Catholic church today, Christ's body and blood are literally in the sacrament in place of the bread and wine,[11] and his whole body is in each species and in each part of each species.[12] The conversion of the bread and wine into Christ's body and blood is a supernatural change brought about by divine act. The change is one of literal transubstantiation,[13] which is analogous to creation or transmutation.[14] Nevertheless, the host continues to look and taste like bread and wine because the sensible properties of the bread and wine—the "real accidents" of scholastic terminology—remain in spite of the conversion or transmutation of one substance into another.[15]

But since accidents exist in a subject or substance, we would normally expect the accidents to disappear along with the substance in which they inhere. This at least was the Aristotelian doctrine. Christian theologians escaped from this dilemma by appealing to the supernatural power of God, to miracle. In the single instance of the Eucharist we have a case of the separation of accidents from substance and the continued existence of the accidents after the substance has disappeared.[16] Thus, Christ's body and blood while really present cannot be seen because the appearance of bread and wine remain, and they must therefore be taken on faith alone.[17]

Furthermore, while the original bread and wine are in space

[11] *Ibid.*, III, Q.75, A.1.

[12] *Ibid.*, Q.75, A.4.

[13] *Ibid.*, Q.76, A.1–3.

[14] *Ibid.*, Q.75, A.8.

[15] *Ibid.*, Q.75, A.5; Q.77, A.1. The Schoolmen following Aristotle called all kinds of being save substance "accidents"; while substance exists *in se*, the other categories all exist *in alio*. To distinguish this use of the term from its use in logic where an accident is contrasted with a property, the Schoolmen frequently used the phrase "real accident." Thus, the whiteness of the bread and the sweetness of the wine—what I have referred to in the text as the "sensible properties"—are real accidents, or to use another scholastic phrase of equivalent significance in this context, they are the "sacramental species."

[16] Cf. Mercier, *A Manual of Modern Scholastic Philosophy*, 3rd English ed., 487–91, from which I cannot forebear quoting the following sentences: "This official decision of the Council [of Trent] asserts the separability of accidents from their natural substance. The possibility of this separation philosophy, left to itself and guided by experience, would most likely never have suspected. But enlightened by the doctrinal authority of the Church, the *Christian* philosopher professes not only the possibility but the fact."

[17] *Sum. Theol.*, Q.75, A.1.

and while the sensible properties of the bread and wine continue in space after the transubstantiation, Christ's body and blood are not spatially extended and spatially located. They are "not in the sacrament as in a place," according to the words of Thomas Aquinas, and by this subtle distinction he sought to avoid the paradox involved in holding that the whole body and blood are in as many different places as there are consecrated hosts.[18] There is at least the merit of audacity in this account. It may make sense, although it is difficult to see what this sense is. How can a single substance become plural except by division, which is expressly denied? How can a physical substance avoid being "in a place"? True, substantial forms are not material entities, but principles of being. Still, the substantial form of a physical substance exists in intimate connection with matter, and it is the resulting "body" or physical thing which is alleged to be present in the sacrament.

In any event, it ought to be clear that any philosophy which finds the essence of body in extension will have even greater difficulty with this cardinal doctrine of Christianity than did Thomas Aquinas and his fellow mediaeval philosophers with their substantial forms. But that the essence of matter is extension is precisely what Descartes did hold, and it was his attempt to reconcile this important tenet of his own philosophy with the doctrine of the Eucharist that led to much of the criticism and persecution which his followers endured.[19]

In one respect Descartes offers a simpler explanation than the Schoolmen, who were forced to explain the continued presence of the sensible properties of the bread and wine after the consecration by an appeal to the miraculous separation of the "real accidents" from their proper substance. According to the philosophy of Descartes the sensible properties of objects are the result of the motions of the particles on their surfaces, these minute surface motions affecting the sense organs of the observer and producing the sensed qualities.[20] Now since the sacramental conversion is

[18] *Ibid.*, Q.75, A.1; Q.76, A.5.

[19] Cf. Bouillier, *Histoire de la philosophie cartésienne,* vol. I, ch. XXI. Descartes was not so prone to theological speculations as Leibniz, and his treatment of this topic, made in part in reply to criticisms of Arnauld to his *Meditations,* was his only excursion into the field. The chief grounds for the later criticisms lay in two letters which Descartes wrote to Father Mesland, who made them public contrary to Descartes' request. For Descartes' attitude toward theology, cf. Gouhier, *La pensée religieuse de Descartes,* Part II, ch. IV.

[20] Cf. *Reply to the Fourth Objections,* Haldane and Ross edition of *The Philosophical Works of Descartes,* II, 116–22.

a literal transubstantiation, the surface remains the same although the substance has changed. Therefore it is only natural that the sensible properties continue unaltered in spite of the miraculous conversion.

However satisfactory the solution to this problem, it leaves the other aspects of the "mystery" of the Eucharist in worse straits. If the essence of material stuff is its extension, and if the volume or extension of the host remains the same, how can it be said that the bread and wine have been converted into the body and blood of Christ? More difficult yet is the question, how can the body and blood of Christ be in many different places at the same time? Descartes sought to satisfy these questions in his two letters to Father Mesland.[21] There is a difference, he argues, between an inorganic and an organic body. The former's essence does consist in extension, and any change in its extension implies a change in its substance. But the essence of an organic body lies in its connection with the soul. A man's body changes both in form and in material content. It grows from infancy to manhood; its material particles are continually being renewed. We call it the same body because it is connected with the same soul, or, as Descartes expresses it in scholastic language, because it is "informed" with the same soul.

He further illustrates this point by arguing that the food we eat becomes incorporated in our bodies, the minute material particles being taken into the blood system and distributed about the body in such a way that, had we the ability actually to see the minute constituents of our systems, we should observe these particles of food composing our bodies. Thus, when Christ ate the bread and drank the wine, their constituent particles became naturally a part of his body. In the sacrament, however, the change takes place "by the force of the words of the consecration." The host *is* the actual body and blood of Christ because after the consecration it is united with the soul of Christ; and this is true of all the hosts at all the altars because each is in the same way united with his soul.

I have summarized the solution as Descartes gave it. Many Catholics, and particularly the Jesuits, were quick to see the difficulties in this explanation and to condemn it accordingly. In the first place, the suggestion that the essence of organic bodies lies

[21] Descartes, *Oeuvres*, ed. Adam et Tannery, IV, 162–170, 345–348.

in the relation to the soul will not stand examination, for no organic body except man, on Descartes' own principles, has a soul. If extension is the essence of the inorganic, relation to the soul the essence of the human body, what is the essence of all other organic bodies which like man change in form and undergo a continual renewal of their material particles?

Much more important, however, is the flagrant inconsistency between Descartes' basic doctrine that the essence of matter is extension and his special doctrine that in certain types of organic matter the essence is the soul. When all is said and done, the Cartesian philosophy is famous for its division of all finite existence into *res extensa* and *res cogitans.* Now a human body, no matter how animated, is still *res extensa.* As extended it is part of the one whole of extension which in reality for Descartes constitutes a single material entity. Bodies in the plural are so many parts of this whole temporarily distinguished by the different motions which give them distinguishable sensible properties. Their unity lies in the fact that this particular part of extension has a pervading motion which differs from that of its neighbors. Another bit of extension may have a similar motion, or set of motions, and hence be like it, but it will still be a different body. If the essence of the body lay in its characteristic motion, or set of motions, then the same body—*idem numero,* as Descartes said—might well vary in size and even shape. It need hardly be repeated, however, that for Descartes the essence of body lies not in motion but in extension. Either then this basic concept must be abandoned or the "explanation" of the Eucharist is unsatisfactory.

Finally, it is worth noting that Descartes' view amounts to the doctrine that the various bits of bread and wine become the body and blood of Christ by becoming connected with Christ's spirit. In itself, this is not an implausible treatment of the problem, but it smacks of the figurative or spiritual interpretation of Augustine[22] rather than of the literal interpretation of Ambrose and Aquinas. While Descartes could quote the words of the Council of Trent, "ea existendi ratione quam verbis exprimere vix possumus," the fact remained that the theologians of the Church sought an explanation in terms of literal, not figurative, transubstantiation. It is ironic

[22] As Bouillier points out in the chapter referred to above, Descartes' stoutest defenders were usually to be found among the Augustinian orders.

that Descartes should himself in his treatment of these difficulties deviate, in implication if not in explicit statement, from the basic tenets of his philosophy and play into the hands of Leibniz, who clearly saw that there could be no final solution in terms of a philosophy which placed the essence of matter in extension.

I have dealt with Descartes' treatment of the "mystery" of the Eucharist in some detail partly because it raises the specific difficulties which Leibniz attacks and partly because Leibniz himself, although quite positive in his condemnation, does not elaborate his reasons for rejecting it. There is some historic justification for this. Cartesianism and the Cartesians were savagely attacked in the second half of the seventeenth century on the ground of atheism; and the reason for this charge lies in the difficulties just discussed. Leibniz, indeed, seems to take it for granted that the recipients of his letters on the subject—the Duke John Frederick, Arnauld, and the editor of the *Journal des Savants*—are so familiar with the controversy that he need merely assert categorically that a solution is impossible so long as the essence of matter is taken to be extension.[23] How can one extension take upon itself a foreign extension? he asks in one place. How, if extension be the essence of matter, can the same substance be in several different places at once? he inquires in another. His further criticism that it is difficult and inconvenient to explain the persistence of the sensible qualities of the bread and wine without an appeal to real accidents, we have already seen to miss the mark. But surely he is right on the first two points. Leibniz is careful not to accuse Descartes of being an atheist, but he is quite certain that this is one of several reasons why Cartesianism inevitably falls into atheism. For that reason, if no other, it must be rejected.

Leibniz is equally positive that he has the only solution to the problem. The problem, he repeats more than once, is to give a rational explanation, one that will refute once and for all the sceptics and atheists who assert that no intelligible explanation is possible. Writing to Arnauld in 1671 he insists that the essence of body lies in motion or in a principle of motion; that the very notion of extension is irrelevant to such a principle; and hence that the substance of body is not subject to conditions of place or ex-

[23] Cf. G. I, 62, 70, 75; G. IV, 345; *Nouveaux Essais*, IV, xx, 10 (Langley, 612). These are, so far as I know, the only references Leibniz makes to the subject.

tent.[24] Writing a short time later to the Duke John Frederick he expresses himself as convinced that "there is in every body an internal, incorporeal, substantial principle distinct from mass, and it is this that the ancients and the schoolmen have called substance."[25] I have already suggested that there is something to be said for the doctrine that motion constitutes the essence of body. Such a view at least has certain obvious advantages in dealing with transubstantiation. So far as I am aware, however, Leibniz never again recurs to this doctrine. We shall meet again, and that frequently, the "internal, incorporeal, substantial principle," in other words the substantial form of Aristotelian and scholastic philosophy gradually transformed into the monad of Leibniz. Descartes in the letters to Father Mesland reverted in spite of himself to a scholastic point of view. Leibniz openly accepts such a position. The only claim that he might have made that he had advanced beyond the schoolmen lies in his treatment of space and time as phenomenal only. If space with all that it involves is an entity of reason and not ultimately real, then indeed one might say that the extensional and positional problems raised by the Eucharist are of no great importance. Contradictions and absurdities matter little among phenomena. But at the time Leibniz wrote these two letters he had not arrived at the doctrine of the unreality of space and time and could not claim the advantages of their unreality. Consequently, it is difficult to see in what sense, if any, his position around 1671–72 was any advance over that of Aquinas or avoided any of the difficulties inherent in the Catholic "solution." His case against the Cartesian position, however, stands. It amounts in the end to this: Christianity is true; the transubstantiation involved in the Eucharist is a cardinal tenet of Christianity; such transubstantiation is irrational and unintelligible if the essence of body is extension; therefore, the essence of body is not extension, and Descartes was wrong in his fundamental contention.

(B) *The inadequacy of extension to explain phenomena.* The two basic principles of Leibniz's philosophy are the principle of contradiction and the principle of sufficient reason.[26] The importance of the latter, according to which nothing happens without a reason, or there must always be a reason why a thing is as it is

[24] G. I, 75. [25] G. I, 62.

[26] Cf. C. 519; G. VII, 309, 355–6. These are but three of innumerable references to these principles or axioms in Leibniz's writings.

rather than otherwise, can hardly be overestimated. One variant of this principle is the core of the present argument. "Since there is nothing in things without a cause," Leibniz wrote to Thomasius in 1669, "bodies must not be assumed to possess any properties the cause of which cannot be made to appear from their primary constitutive principles."[27]

According to Descartes there is one property, and one property only, possessed by all physical objects, namely extension. This is the essence of all matter or body or corporeal substance.[28] The fourth Principle of the Second Part of Descartes' *Principles of Philosophy* reads: "That the nature of body consists not in weight, nor in hardness, nor color and so on, but in extension alone." And the argument begins: "In this way we shall ascertain that the nature of matter or of body in its universal aspect does not consist in its being hard or heavy or colored or one that affects the senses in some way, but solely in the fact that it is a substance extended in length, breadth, and depth." It follows from this that there can be no real distinction between body and space. They are in truth the same and differ only in our way of looking at them.[29] This famous doctrine has the merit of great simplicity, but the disadvantage of being demonstrably false. It is beset with difficulties. Can the various properties of matter be deduced from the nature of extension? The answer is clearly no. Neither extension nor its "modes"—size, form, and motion—will suffice to explain the properties which bodies are found by experience to possess. It is not necessary to enumerate all such properties. It will suffice to show that certain pervasive and scientifically important features of physical objects are not deducible from their extension. Leibniz selects three and demonstrates that extension cannot account for (1) antitypia, (2) inertia, and (3) force.

(1) One such property is *antitypia.* In various places Leibniz equates this word, sometimes given in Greek, sometimes in Latin, with impenetrability, resistance, density, the power of filling space, the inability of a body to exist with another in the same space.[30]

[27] G. I, 26; G. IV, 173; Langley, 647; cf. also G. IV, 464; D. 42.

[28] I shall for the present use these terms interchangeably, as Descartes and Leibniz did. I shall examine below the question whether on Leibnizian principles it is proper to speak, as Leibniz all too frequently and confusingly does, of corporeal substance.

[29] Pt. II, Princ. X, XI.

[30] G. I, 17, 24, 26; G. IV, 165, 171, 173; Langley, 637, 645, 647.

Literally it means "repulsiveness." The most frequently used equivalent is resistance, but since Leibniz also uses this term to cover inertia, it will avoid confusion if we translate antitypia as impenetrability. Leibniz holds that it is a universal property of all bodies or corporeal substances.[31] It is clearly different from their extendedness. Since it cannot be derived from the concept or definition of extension, primary matter is composed of both extension and impenetrability.

It is important to be clear on just what points Leibniz agrees with Descartes and on what points he differs. He agrees that it is in the nature of body or matter to be extended.[32] He is just as positive about this in later life when he had arrived at the position that space and hence bodies are phenomenal as he was in his earlier Cartesian years when he considered matter as real. He agrees also that wherever there is extension there is matter or body. There is no empty space, the apparent emptiness of certain areas of space being a sensible illusion.[33] He does not agree, however, that extension and matter are one and the same thing. Hence he does not agree that extension is the essence of matter. He insists upon distinguishing between space as a primarily extended entity or "mathematical body" and matter as a secondarily extended entity or "physical body."[34] And the difference is not merely one of our mode of conceiving them, although Leibniz's frequent statements about space as an abstraction from extended objects might seem to suggest this. It is a real difference, for the property which all physical bodies possess in addition to extension, and which extension abstractly considered in itself does not possess, is antitypia.

In his *Animadversions on Descartes' Principles,* written in 1692, Leibniz attacks the doctrine that extension is the essence of matter. In his comments on the fourth Principle of Part II he distinguishes between hardness as that property of some bodies by which they preserve their form, and impenetrability or the inability of two homogeneous bodies to exist in the same space—a property of all bodies asserted apparently on the basis of empirical evidence. Leibniz, as was his custom, circulated these *Animadversions* among

[31] In one passage he speaks of it as the essence of matter or form of corporeity (G. I, 17; G. IV, 165; Langley, 637), but this suggestion is quickly discarded.

[32] For a few references taken from different periods of his life cf. G. I, 18; G. IV, 165; Langley, 637; G. IV, 466; D. 44; G. VI, 581.

[33] G. I, 26; G. IV, 173; Langley, 647.

[34] G. I, 24; G. IV, 171; Langley, 645.

a number of his learned friends for comments and criticisms. Bayle's comments were transmitted to him by Basnage de Beauval, the editor of the *Journal des Savants*. Bayle could not understand how bodies could possess internal principles of resistance by which they make an effort to remain in the same place. If, he suggests, this phenomenon could be explained by an external principle, it would still be true that the essence of bodies is extension.[35] Leibniz's reply is instructive. "I do not conceive that a thing which has only extension for its essence could resist by means of an external principle, for even if one should grant this external principle, I hold that it is not possible for it to produce resistance in a subject which is merely extended, because it is inconceivable that resistance be a mode of extension."[36] Here Leibniz is clearly right. There is nothing in the nature of extension from which we can deduce the property of impenetrability. The property of filling space to the exclusion of other objects is distinct from the property of being extended, even though we hold that the two are in fact inseparable in physical objects.

(2) According to classical physics *inertia* is the primary property of matter.[37] "Whatever can be changed in motion only by the application of force is called *matter*. That property which requires force to change either the magnitude or the direction of the motion of a body is called *inertia*. Inertia is the distinguishing characteristic of matter."[38] This highly familiar notion was first made explicit in the seventeenth century, although it was far from being commonly or accurately understood. Galileo is generally given the credit for having first discovered the so-called law of inertia, and both Huygens and Newton understood its significance.[39] Leibniz also grasped its nature and importance.

This is well illustrated in his correspondence with de Volder, who objects to his emphasis on inertia, contending that the quality by which a body remains in the same state is a necessary consequence of the extension of the body, and that the body will not change unless there is some reason or cause for that change. Leib-

[35] G. III, 92. [36] G. III, 97.

[37] I use the phrase "classical physics" to denote that body of knowledge which was increasingly systematized from the 17th to the 19th centuries and to distinguish it from certain modern positivistic views according to which inertia, motion, force as used in this chapter are meaningless concepts.

[38] Ferry, *General Physics*, 3–4.

[39] Cf. Mach, *The Science of Mechanics, passim.*

niz replies: "Let there be in matter a force of preserving its own state; that force can in no way be deduced from extension alone. I admit that every single thing perseveres in its own state until there is some reason for change—a principle of metaphysical necessity. But it is one thing to preserve a given state until something brings about a change, since it is in itself indifferent to rest or change; it is another and a far more important matter to be not indifferent and to have a force or inclination as it were for maintaining a given state and hence offering resistance to a cause of change."[40] This is Newton's "resident force" or "*vis insita.*" Leibniz differs from the classical physicists in that he does not view inertia as *the* distinguishing characteristic of matter. For Leibniz matter is essentially passive; it is the combination of impenetrability with inertia or resistance. Together they constitute the "passive principle" of *materia prima* or mass.[41]

Can inertia be deduced from extension? Extension is indifferent to motion and rest. Inertia, however, is not mere indifference; it is actual resistance to change. If motion or change involves positive force, then inertia is a kind of negative force. It involves a dynamic quality whereas extension is purely geometrical. Hence inertia, more obviously even than in the case of impenetrability, is not derivable from extension.[42]

Another way of demonstrating the same conclusion is by considering the laws of motion. This is a topic which I hope to treat in some detail at a later date, but as one aspect of the conflict between the Cartesian laws of motion and the Leibnizian laws of force is highly relevant here, I must anticipate briefly one of the arguments. If, Leibniz argues, the essence of bodies were extension, then, since extension is indifferent to motion and rest, body A in striking body B ought not to lose any of its original velocity, and the two ought to continue together after their concurrence with the velocity of body A. Experience teaches us plainly that this is not the case. The actual laws of motion necessitate a property in bodies distinct from extension, namely resistance or natural inertia.[43]

(3) Besides extension, impenetrability, and inertia all bodies

[40] G. II, 170. [41] G. II, 171; G. IV, 510; D. 127.

[42] Cf. *On Nature in Itself*, #11.

[43] This argument is stated in a number of places, but nowhere more clearly and concisely than in two letters to the editor of the *Journal des Savants*, one written in 1691, the other in 1693. Cf. G. IV, 464–7; D. 42–6.

possess the property of *force*. We approach here one of the most complex and one of the most fertile concepts in Leibniz's philosophy. Here again I hope later to devote careful attention to unraveling the steps by which Leibniz arrives at this centrally significant notion and to showing its consequences. All true substances are for Leibniz active. In other words, the concept of substance and the concept of active force are intimately connected. This is not a position at which he arrives over-night. If in the present connection I make dogmatic assertions or seem to beg important questions, I can only plead the impossibility of treating all aspects of Leibniz's philosophy simultaneously.

There is such a thing as action or activity. Bodies apparently at rest do begin to move; those in motion are brought to a stop; the velocity of motion may be accelerated or retarded. In short, changes do occur, and a change necessitates an active cause of change, i.e., force. Now force differs from motion, for it is force that causes and controls motion. Motion might conceivably be deduced from force, as the effect from the cause, but force cannot be derived from motion. And if motion is not deducible from extension, as Descartes himself admits in ascribing all motion ultimately to the will of God and thus importing it from without into his geometrical universe, it follows *a fortiori* that force is not deducible from the concept of extension.

Leibniz seeks to drive this conclusion home in a number of ways. Motion is change of place; it is an alteration in the spatial relations of two or more bodies. It is relative in the sense that an alteration in spatial relations does not tell us which of the two or more bodies has actually moved. As relative, motion is not ultimately real. Nevertheless, behind phenomena like motion there must be some metaphysical reality. Leibniz maintains that the ultimate reality underlying motion is force.[44] Further, the general property of resistance (here interpreted to include both impenetrability and inertia) is said to involve, in some obscure way yet to be determined if possible, activity and passivity. Once action is granted, the necessity of the concept of force immediately follows.[45] Finally, inertia, or resistance in the narrower sense, while not deducible as we have seen from extension, is explicable in terms of the laws of force.[46] There is a certain ambiguity here in Leibniz's statements.

[44] Cf. *Discourse on Metaphysics*, #18.

[45] Cf. G. IV, 465; D. 44; G. II, 227.

[46] G. III, 94.

On the one hand, he argues that resistance to motion, although a passive force, is nevertheless a manifestation of force in general and hence to be explained in terms of the general concept of force.[47] On the other, he contends that matter and its constitutive principle of resistance are primarily passive, and hence that we must have recourse to some distinct and positive source of activity, namely force.[48]

The conclusion is obvious. So far is force from being explicable in terms of extension that, on the contrary, the very principles of the extended world of mechanics are to be sought in the metaphysical realm of dynamics. This is well summed up in the letter of 1691 to the editor of the *Journal des Savants* already referred to.

> All this shows that there is in matter something other than what is purely geometrical; that is, than extension and its changes pure and simple. When we consider matter attentively we perceive that there must be joined to it some higher or metaphysical notion, to wit: that of *substance, action,* and *force;* and that these notions show that everything which suffers must act reciprocally, and that everything which acts must suffer some reaction; and consequently that a body at rest cannot be carried along by another in motion without changing something of the direction and the velocity of the agent. . . . This consideration seems to me important, not only in order to know the nature of extended substances, but also in order not to slight in physics the higher and immaterial principles to the prejudice of piety. For although I am persuaded that everything takes place mechanically in corporeal nature, I do not cease to believe also that even the principles of mechanics, i.e., the first laws of motion, have a more exalted origin than that which pure mathematics can furnish.[49]

Extension is unable to account for various important properties which bodies do in fact possess. This is the essence of the present section. We have now examined the situation with respect to three such properties, and we have found that from the purely geometrical concept of extension it is impossible to deduce the properties of impenetrability, inertia, and force. If we accept the principle of sufficient reason, according to one aspect of which there can be nothing in bodies which is not deducible from their inner nature, we must agree with Leibniz that the concept of bare extension is hopelessly inadequate for the concept of matter or corporeal substance.

[47] G. III, 94; G. IV, 466; D. 44.

[48] G. VI, 587; B&C II, 370; *On Nature in Itself,* #11.

[49] G. IV, 465–6; D. 44. Cf. also *Discourse,* #18; *On Nature in Itself,* #11; *Animadversions,* II, Princ. 64; G. IV, 472, 478; L. 300; G. II, 241.

(C) *The argument from individuality.* There are compounds, says Leibniz at the beginning of the *Monadology,* and therefore there must be simple substances. Many people would agree with Leibniz on this point. An automobile, a book, a building are compounds. They are composed of their constituent parts which may be simple or themselves compounds. In the latter case we must seek the parts of the parts until we come to the simple ingredients. The science of physics has been much occupied with this investigation and has offered at different stages in its history a variety of simple entities as the ultimate building blocks of the physical universe. Physicists have for the most part been content with physical units—minute, but nevertheless actually extended entities which possess in addition to extension one or more non-geometrical properties. Unfortunately for the harmony of physics and metaphysics, this attempt on the part of the physicists has always seemed to ultra-rationalistic philosophers to be futile. Leibniz insists time and again that whatever is extended is at least in theory divisible and hence not simple. Indeed, Leibniz holds, as we shall see, the peculiar doctrine that every extended thing is not only theoretically divisible but actually divided *ad infinitum.* As one of the most thoroughgoing rationalists in the history of metaphysics, he asserts the proposition that the ultimate constituents of reality must be *absolutely* simple, i.e., that the ultimate elements of physics must be metaphysically ultimate and simple as well.

It is clear that when the physicist calls the atom or the electron simple and when the metaphysician denies this, they are using different meanings of simplicity. And when we consider the internal complexity of Leibniz's monads, his simple substances, and contrast them with the internal simplicity of the physicist's ultimate units, the difference in meaning becomes even more apparent. Three different meanings are important in this connection.[50] (i) What is simple is in contrast to the complex. In this sense electrons are simple, but monads are highly complex. (ii) The simple is that which is without parts, meaning here by "part" any structure within the whole object which stands out by virtue of its own form or intrinsic property. Thus a book, a melody, a consciousness

[50] I have taken these from the admirable and illuminating analysis of the term "simplicity" in Herbert Spiegelberg's *Über das Wesen der Idee,* I. Abschnitt. This essay first appeared in the *Jahrbuch für Philosophie und Phänomenologische Forschung,* Bd. XI, and was reprinted separately in 1930 by Max Niemeyer.

have parts, whereas a line, pure time, the spectrum, indeed any continuum, have none. In this sense electrons are simple, but monads are not. (iii) The simple is the indivisible. The difference between this meaning of the term and the preceding can be expressed by saying that according to the second view a simple entity is without divisions, while according to the present distinction it is incapable of division. In this sense atoms and electrons are clearly not simple since they are capable of at least theoretical division, while in this sense, and only in this sense, monads are simple. Thus monads are not internally simple; and since each monad is a universe in itself the "parts" of which can be distinguished, they are not simple in being without parts. They are, however, simple in the sense of being unextended and hence without physical parts either actually or theoretically.

With this meaning of simplicity in mind let us turn directly to Leibniz's arguments. By invoking again the principle of sufficient reason Leibniz seeks to show that the Cartesian concept of extension cannot explain the simplicity, the individuality, the self-identity of the metaphysically necessary constituent substances of the universe. It is obvious from the foregoing that simple elements cannot be deduced from extension. Whatever is extended is necessarily composite; the very notion of extension involves plurality. This is so important an aspect of Leibniz's attack on extension that I shall leave its elaboration and proof to section (E). Leibniz of course recognizes that any given extent, say an inch or a foot, may be treated as a unit. But this is an arbitrary unity imposed by our way of thinking. It is in Leibniz's language abstract and not in the nature of things.[51] Such a unit is simple in the second sense defined above, for as any given extent it is a continuum without actual parts. But nothing extended is simple in the third sense, for nothing which is extended can escape at least theoretical division. In Leibniz's sense of the term the simple cannot be found in extension.

If extension cannot account for the simplicity of ultimate substances, can it account for the individuality of physical objects? How is it that one object differs from another—this book from that one? What is it to be one individual thing, identical with itself, and different from all others? For Descartes the one, solid, extended, substantial world is carved up into particular physical objects by motion. When the motion or set of motions in one part

[51] G. II, 170.

of space differs from that in adjacent parts, we distinguish different objects with different sensible qualities. And it must be added that on Cartesian principles, since space is real, we can distinguish different objects by locating them in different parts of space.

Leibniz is clearly right in holding that this explanation is quite unsatisfactory, although all of his reasons are not equally convincing. His most frequent basis of attack is another important principle or axiom—the principle of the identity of indiscernibles. This may be stated in a number of ways: where there are no discernible differences, there is no plurality; two objects or things cannot be *two* unless they possess at least theoretically discernible qualitative differences. So stated this sounds like a principle of epistemology; but while it has uses in epistemology, its real nature is metaphysical. Leibniz is not really telling us how we can know that two objects differ; rather he is asserting that they cannot in fact be two, or differ even in number, unless they possess *some* qualitative difference. This is Leibniz's answer to the problem of individuation. It is opposed to the Cartesian theory which distinguishes individuals by their peculiar motions and locations in space and time. It follows from this theory that two objects may be identical in all their material and sensible properties and still be two, provided that they have different spatial and temporal attributes.

Leibniz, however, as I have pointed out, had by 1686, if not ten years earlier, ceased to believe in the reality of space and time. Hence space and time could not be used by him as principles of individuation. Hence further, if two objects are to differ in the numerical sense of being two, they must also differ in some qualitative sense. Since, according to the variant of the principle of sufficient reason which underlies all of the present arguments, there can be nothing in things which does not follow from their nature or essence, the qualitative differences of two material objects must flow from some inner substantial difference. Leibniz considers this a striking confirmation of his insistence upon the necessity of substantial forms for any ultimate account of mechanical phenomena.[52]

If space is unreal, it is natural to consider extension as likewise unreal. Leibniz, as we shall see, reverses the argument: extension is unreal, and hence space is merely an entity of reason, the order of all possible coexistences. It is not logically necessary to hold

[52] Cf. *Discourse*, #12; M. 135, 154–5, 161, 162, 190–2; *New System*, #3; G. IV, 345.

such a view. Space might indeed be phenomenal, while material objects possess the quality of being extended. This is an odd position, but it happens to be the one which Leibniz temporarily adopts—perhaps for the purposes of argument—in discussing the problem with the Dutch disciple of Descartes, de Volder. "You are of the opinion," Leibniz writes in 1703, "that those who distinguish bodies solely by the modes of extension (as they call them), as nearly everyone does today, do not deny that bodies differ only modally—at least if the vacuum is excluded. But two individual substances must be distinguished more than modally. Otherwise according to common doctrine it will be found that they differ not even modally. For if you take two bodies, A and B, equal and with the same figure and motion, it will follow from such a notion of body—that is, from one drawn from the putative modes of extension only—that there is no intrinsic property by which they are distinguished. Are they therefore diverse individuals? Or is it possible for things to be diverse which can in themselves in no way be distinguished? Such consequences and innumerable others of the same kind show clearly enough that the true notions of things are plainly subverted by that new philosophy which forms substances from matter alone or from what is passive. Whatever things differ must differ in some way or other or must have an assignable diversity in themselves, and it is astonishing that men have not made use of this most obvious axiom together with so many others."[53]

In itself this is an inadequate reply to Descartes. If I hold that space and time are principles of individuation and therefore that two contemporary objects in different parts of space are nevertheless different although identical in all other respects, it is not sufficient to reply that my conclusion is absurd because space and time are not real and hence not valid principles of individuation. My conclusion may be false if my premise is false, and it is my critic's duty to demonstrate its falsity. Now Leibniz's grounds for impugning the reality of space and time are to be found primarily in his criticisms of the Cartesian doctrine of extension, and one of these criticisms is that it cannot account for the individuality of different objects. Considered in itself, therefore, the argument is circular. Leibniz, however, has other and quite independent arguments by which he seeks to show the unreality of space and time. When we combine these with the present line of reasoning, we get

[53] G. II, 249.

a better understanding of the real grounds for Leibniz's rejection of the Cartesian doctrine of extension.

There is another difficulty in explaining individuality or self-identity in Cartesian terms—a difficulty which Leibniz never clearly states, but which may be implied by certain statements in the not entirely clear thirteenth section of the essay, *On Nature in Itself*. For Descartes, it will be remembered, particular extended objects are precipitated out of the one substantial whole of *res extensa* by motion. Any given physical object, such as a book, is the subject of two different motions. There is that internal motion, or set of motions, by which the object is primarily characterized and by which it gets those sensible properties we ordinarily discover in it. There is also, or there may be, an external motion or translation by which the object gets from one part of space to another, as when I take a book out of the bookcase and put it on the table by my typewriter. Thus, in so far as a body moves, it would seem that a characteristic motion, or set of motions, is literally transferred by another motion from one part of space to another. But the first kind of motion can be nothing but the second kind of motion applied to what for convenience I call the constituent particles of the object in question. What constitutes a particle, however? If the essence of matter is extension, if all variation is due to motion, then the particles which are subject to the motion of translation must in turn be constituted by another motion or set of motions—namely, those which give them whatever characteristics they possess as particles. But this is an infinite regress. If it were a true account, we should never have any particular objects with specific properties. Hence any attempt to place the essence of matter in pure extension and the determining factor of individuation in motion is bound to break down.

Thus the answer is clearly "no" to our original question, can we deduce from extension the simplicity and individuality which it is metaphysically necessary that some substances possess? After distinguishing between various meanings of the term "simplicity," I have sought to show that Leibniz is correct in maintaining that whatever is extended is not (in his sense) simple since it is theoretically, if not actually, divisible—although I have not given in this section his proofs for this doctrine, nor have I taken sides in the issue whether theoretical divisibility is important where actual division is either impossible or does not in fact occur. I have

further tried to show that Leibniz is in principle correct in his contention that extension cannot account for the individuality of things. Granted the principle of the identity of indiscernibles and granted the unreality of space and time, this conclusion is unavoidable. But quite apart from these two presuppositions, it is possible to show not only that extension alone is inadequate, but also that extension together with motion (Descartes' real position) is inadequate to account for the individuality of self-identical things and the differences of different objects.

(D) *The argument from the principle of plenitude.* The world we live in is a motley world, full "of shoes and ships and sealing wax, of cabbages and kings." So much will be granted by everyone. For Leibniz, however, the world is not only multifarious; its diversification is infinite. God has not been niggardly in his creation. He did not create in a haphazard or capricious fashion. He created everything which it was possible for him to create in the best of all possible worlds. That does not mean that he created everything, for God's intellect envisages an infinite number of possible universes, no one of which is compossible with any of the others. Why did he create this particular one? Because it is the best. Why is it the best? Because—at least this is part of the reason—it is the richest, the most varied and complex, the most diversified, the fullest. We have here an instance of that metaphysical dogma which Lovejoy calls in *The Great Chain of Being* the principle of plenitude. He describes the principle as "not only the thesis that the universe is a *plenum formarum* in which the range of conceivable diversity of *kinds* of living things is exhaustively exemplified, but also any other deductions from the assumption that no genuine potentiality of being can remain unfulfilled, that the extent and abundance of the creation must be as great as the possibility of existence and commensurate with the productive capacity of a 'perfect' and inexhaustible Source, and that the world is the better, the more things it contains."[54]

If we follow Lovejoy, the principle of plenitude fuses with the principle of sufficient reason in the philosophies of Spinoza and Leibniz. Everything which exists must have a sufficient reason, and this is God. But God, who is complete and self-sufficient, must have some reason for creating one kind of a world rather than an-

[54] P. 52. I am particularly indebted to chapter V which contains a valuable and instructive discussion of several aspects of Leibniz's philosophy.

other. Now this reason can only be one of value or good. If it is good to exist, or if it is better to exist than not to exist, then a rational God will create that world which contains a maximum of existence. What is to be the criterion of the maximum of existence? At least one is suggested by Leibniz in his assertion that God creates everything which is compossible in the fullest and richest of possible worlds.

It is important to note, however, that while the principles of plenitude and of sufficient reason work in close cooperation in the philosophy of Leibniz they are nevertheless distinct principles. The one asserts that everything which exists must have a sufficient reason; the other tells us what that reason is. The proposition that existence is better than non-existence cannot be deduced from the principle of sufficient reason; it is merely a restatement of the principle of plenitude. It is conceivable that God might have had some other reason in creating the world, some other criterion of what would constitute the best. He might, for example, have been moved by an aesthetic consideration and preferred a neat and tidy universe to an overstuffed one. Nor do I see that such a standard would be any less rational than the principle of plenitude. Indeed, even Leibniz exhibits a certain uncertainty as to the ways of God. As Lovejoy points out, he wavers in interpreting the criterion of compossibility between a purely quantitative view according to which the greatest numerical variety of existents was created and a qualitative view according to which, humans being worth more than earthworms, the greatest "intensive" amount of existence would be created.

Be that as it may, we live in a wonderfully rich and diversified world. So far as the argument of the present essay is concerned, the real question is: can this diversity and richness be explained in terms of extension or of extension and motion? There is nothing in the concept of mass itself or of mass in motion from which one could deduce the infinite variety of the actual world. The Cartesian metaphysics stands condemned by the principle of sufficient reason, and even the addition of the principle of plenitude would not suffice to overcome the difficulty. Whether this is sufficient justification for the re-introduction of Leibniz's beloved substantial forms or whether they in themselves can account for the richness and variety of the world need

not concern us now. While the positive aspect of Leibniz's position may be doubtful, the attack on Descartes is valid.[55]

(E) *The argument from complexity and relativity.* In section (C) of this essay I made use of the argument that what is extended is for that very reason not simple, that whatever is extended is at least theoretically divisible. It was not necessary in that connection to examine in detail Leibniz's reasons for this statement. The argument of section (C) was hypothetical. It ran: if extension is by its very nature composite, then it obviously cannot account—as the principle of sufficient reason demands that it should—for the absolutely simple substances which are the building stones of our metaphysical universe. It is the business of this section to examine Leibniz's reasons for insisting that extension is a complex notion. There is no appeal here to the principle of sufficient reason; it is a question of what is involved in the ordinary meaning of the term extension.

For Descartes extension is a simple notion, a clear and distinct idea, a primitive concept not subject to further analysis. This, according to Leibniz, is the root of all the difficulties in Cartesianism. Extension is not a simple or primitive concept, since it is susceptible of analysis. It is not a clear and distinct idea, since it gives rise to all the problems of the continuum.[56] It is not plain precisely when Leibniz gave up his early adherence to the Cartesian position, but the problem of the continuum was clearly bothering him by 1676, and in the essay entitled *Generales Inquisitiones de Analysi Notionum et Veritatum,* written in 1686, his more mature view is fully apparent.

> Among primitive simple ideas seem to be classified all the notions which contain matter of some quantity, or in which homogeneous things harmonize with one another, in the sense of having magnitude whether extensive, intensive, or enduring; but unless I am mistaken these notions can still be resolved. It is especially open to doubt whether the notions of what is extended or thinking are simple. Many think that these are notions which are conceived through themselves and need no further resolution, but it would seem that an extended object is a continuum having coexistent parts.[57]

[55] Cf. M. 193; *On Nature in Itself,* #13; G. II, 226–7, 249–50; G. IV, 399–400; Langley, 705–6.

[56] Cf. C. 361; M. 163, 194; B&C II, 376; G. II, 183, 269; G. IV, 393–4; Langley, 699–700; *Animad.* I, 52.

[57] C. 361.

Extension involves continuity, coexistence of parts, and plurality. Leibniz returns time and again to an emphasis on these three aspects of whatever is extended.[58] If the concept of extension contains these notions, then it is clearly not simple, primitive, and unanalyzable. It is obvious that whatever is extended involves a continuum with coexistent parts. These parts need not be actual, like the parts of a picture puzzle. It suffices that they can be discerned by the mind. Further, if extension is spread-outness or diffusion or repetition, there must be something which is spread out, diffused, repeated.

> Those who hold that extension itself is a substance reverse the order of words as well as of thoughts. Besides extension there must be a subject which is extended, that is, a substance to which it belongs to be repeated or continued. For *extension* signifies only a repetition or continued multiplication of that which is extended—*a plurality, continuity, and coexistence of parts;* and hence extension is not sufficient to explain the nature of the extended or repeated substance, the notion of which is anterior to that of its repetition.[59]

Extension is like number, which presupposes something that is numbered. "But hence it appears that something is presupposed which is continued or diffused, as whiteness in milk, color, ductibility, and weight in gold, resistance in matter. For in itself continuity (extension being nothing else than simultaneous continuity) no more constitutes a substance than does multitude or number, since it is necessary that something be numbered, repeated, continued." [60]

Since whatever is extended is continued, diffused, repeated, and since whatever is extended involves something other than the continuity, diffusion, or repetition, it follows that what is extended is always an aggregate, a plurality. It is like an army or a flock or a herd, or again like a cheese full of worms—the illustrations are Leibniz's. Extension is "only an attribute of an aggregate resulting from several substances." [61] Whatever it is that is diffused or repeated in extended objects must therefore be the ultimate constituents of things. These are Leibniz's simple sub-

[58] Cf. C. 361, 408; G. II, 169–70, 183, 227, 269; G. IV, 393–4; Langley, 699–700; G. VI, 584; *Animad.* I, 52; N.E. II, xiii, 15. [59] G. IV, 467; D. 46.

[60] G. II, 170; cf. also G. II, 241, 269; G. IV, 393–4; Langley, 699–700; G. VI, 584.

[61] G. II, 187; cf. also G. II, 193, 205.

stances, his substantial forms or entelechies, his units of force—in short, his monads.[62]

Leibniz has made out his case: according to one very important sense of simplicity, what is extended is not simple. I should like to leave the matter so, but unfortunately Leibniz's arguments raise two questions which we must face. (1) What is the relation between extension and the extended? (2) Is it possible to hold that the extended can be constituted by non-extended entities?

(1) Leibniz's answer to the first question is that extension is an abstraction from the extended.[63] It is an incomplete or abstract or mathematical notion. There is such a thing as mathematical or arithmetical unity, but this is quite different from the true unity of substance. Leibniz makes some illuminating comments on this point in his remarks on Foucher's objections to his *New System*.[64] Any given extent is divisible, as we have seen. Likewise any number can be broken up into smaller number or fractions. Thus 1/2 is 2/4 or 4/8 or 8/16 and so on. This is an endless process, and it indicates to Leibniz something indefinite and incomplete in such abstract notions. On the other hand, the fraction 1/2 is in one sense a simple unity of its own. We do not arrive at it by first compounding it out of fourths and these out of eighths and so on. On the contrary we arrive at the notion of fourths by dividing 1/2.[65] When we deal with concrete reality, however, the story is quite different. An automobile is not anterior to its constituent parts. An ideal automobile may be, i.e., one existing solely in the engineer's mind or on his blue-prints, but an actual automobile is clearly dependent upon the existence of all its essential parts. The actual whole—i.e., a real existent object, a "complete being" in Leibniz's phrase—presupposes the actual existence of all its parts. An actually extended object, therefore, presupposes the existence of its constituent elements.

What does Leibniz mean when he calls an extended object

[62] Cf. G. IV, 491–2, L. 329–30; and various of the references above.

[63] Cf. G. VI, 582, 584; N.E. II, xiii, 15.

[64] Cf. G. IV, 490–2; L. 329–30; cf. also G. II, 170, 268–9.

[65] "Hence it may be said that, considered in the abstract, 1/2 and 1/4 are independent of one another, or rather the total ratio 1/2 is anterior—in the order of reason, as the Scholastics say—to the partial ratio 1/4, since it is by the subdivision of the half that we come to the fourth, following the order of what is ideal; and the same is the case with the line, in which the whole is anterior to the part because the part is only possible and ideal." (G. IV, 492; L. 330.)

complete and mere extension incomplete? In Section 8 of the *Discourse* he identifies the concept of a complete being with the concept of an individual substance. In writing to Arnauld he denies that extension can constitute a complete being on the grounds that in extension there is only the present, and that past and future, action and change, are lacking from the concept of extension.[66] To Bernoulli he characterizes incompleteness as suffering without acting and vice versa.[67] Bayle's article *Rorarius* draws the comment that a complete being is to be defined as one which contains in itself the source of all its actions.[68] I take it that these later statements are all variations on the thesis of the *Discourse,* and that they are so many ways of describing the various characteristics of an individual substance. A complete being, then, is one that can, in the world of real objects, stand on its own legs. It is that which needs nothing else save God in order to exist. It is that which can be conceived in and through itself. To be complete is, among other things, to be concrete. To be incomplete is not necessarily to be abstract, but what is abstract is for that very reason incomplete. An extended material object is an instance of the one; extension, of the other.

One other question concerning the relation of extension to the extended must still be raised. If extension is always abstracted from the extended, it would follow that there can be no extension which is not the extension of something. This is precisely what we have seen Leibniz to hold. But is it true? Many today believe that we live in an extended universe which is mostly empty space, that there are inter-stellar distances which are not the extensions of any *thing*. In similar fashion no contemporary physicist denies that there is extent or volume in a vessel from which all the air, or nearly all, has been exhausted. It is true that some speculators have postulated the existence of an ether which prevades these allegedly empty spaces, but the reason for this assumption lies in the supposed necessity for some material medium for the propagation of light. The ether, however, is in disrepute. Its supporters are metaphysicians, not physicists, and it is pertinent to ask whether it is not an unnecessary concept. To a twentieth-century Leibnizian it would still be necessary for the very existence of inter-stellar distances, and with this we are back to the original argument which we must now examine more carefully.

[66] M. 155. [67] B&C II, 373. [68] G. IV, 543–4.

I cannot but think that Leibniz is guilty of serious confusion between extension and extended objects. I grant that extension is not a simple notion, and hence that he is right in criticizing Descartes for a failure to carry the analysis to its conclusions. I grant that there is something more to an extended object than its extent, and therefore that extension is not sufficient in itself to account for the nature of material things. There is an obvious difference between the three-foot width of an open door and the three-foot door which sometimes fills it. The distance or extent is the same, but I can walk through the three-foot extent of the open door while I cannot walk through the door itself. I grant further that extension in a certain sense is abstract.

But here is the confusion. We often mean two quite different things by extension. We mean sometimes extent and sometimes extendedness. Now extendedness as the common quality of all extents is abstract, just as redness is abstract. And this is equally true of the determinate forms of the determinable extendedness. Three-footness is abstract; it is a property shared in common by certain doors and doorways, by yardsticks, and by the sides of many bridge tables. I frequently meet with three-foot lengths in my experience, but I have never yet *met* three-footness. It does not follow, however, that because a universal is abstract a specific manifestation or instance of it must be so. This Leibniz would admit, holding that all embodiments of such a universal are material extended things. But the specific distance between point A and point B, a distance let us say of three feet, is not itself the universal although it manifests it; nor need it be the extent or distance of some material thing. The argument that it must is based upon the assumption that what is not the extent of some material object must be an abstraction, and this in turn is based on the confusion between extension as extendedness, which is an abstraction, and extension as extent, which may be specific.

It might be retorted that the view which I am here defending presupposes the reality of space and time and that Leibniz denies this. I should grant the retort, but not its implication. For in the end Leibniz's denial of the reality of space and time depends in part at least upon his doctrine of the abstract, incomplete, and hence unreal character of extension. If he can establish the unreality of spatial and temporal phenomena by other arguments, then extension will pass into the limbo of *phenomena bene fundata*

with them. But it still remains true that the present argument does not suffice in itself, as Leibniz thinks it does.

(2) Can extended aggregates be constituted by non-extended entities? This is a very important metaphysical question. We have seen that what is extended is for Leibniz an aggregate. To be extended is to be theoretically divisible. Indeed, Leibniz holds that the world of extension is not only infinitely divisible, but infinitely divided, although his reasons for this opinion do not concern us here. Here, however, is the problem. In the division of the extended world we never come to any parts which are not themselves extended and hence further divisible. How, then, can Leibniz hold that extended objects are ultimately composed of indivisible entities? To be indivisible is on his grounds to be unextended. While this may be an accurate description of simple substances or monads, how are we ever to arrive at these "units" by an analysis of the extended—an analysis which in the nature of the case never leads to the unextended? Or, to reverse the order of the problem, how can a world which is infinitely divisible and infinitely divided be composed of indivisible and unextended units or entities? Is not such a contention palpably impossible?

It is not surprising that de Volder was confused by the apparent paradox. To his objections Leibniz replies:

> Whatever thing can be divided into several things (now actually existing) is composed of several things; and whatever is an aggregate of several things is not one save in the mind, nor has it any reality save that borrowed from its contents. From this I inferred that there are consequently indivisible unities in things, since otherwise they would have no true unity nor any independent reality—which is absurd. For where there is no true unity, there is no true multiplicity. And where there is only a derivative reality, there will never be any reality, since reality must belong to some subject. . . . But you substitute a somewhat different conclusion from mine, and I do not follow how you think it can be inferred from my words. For you would have as the right conclusion that indivisible unities do not belong to corporeal mass. But I think that the contrary follows, namely that in bodily mass or in the things constituting bodies we must have recourse to indivisible Unities, or prime constituents as it were. Perhaps you mean that the conclusion is correct that corporeal masses themselves are not indivisible unities. I admit this, but that is not the question. For bodies are everywhere and always divisible, nay actually divided as well, but this is not true of their constituents.[69]

[69] G. II, 267–8.

I think that Leibniz's position on this point is neither absurd nor self-contradictory, although I doubt whether all his arguments can be defended or whether he can be said to have proved his point. Is there, after all, any valid reason for holding that extension or extended objects cannot be composed of non-extended entities? Extension would of course be phenomenal on such a view. It would be an appearance different in kind from the constituents which give rise to it. But this is precisely Leibniz's position with regard to extension and all its manifestations. The world of extension consists of *phenomena bene fundata.* It is not difficult to find certain parallels which may do something to allay the suspicion of the sceptic. Kant held that behind the phenomenal world of space and time and necessity lay a noumenal world out of space and time and undetermined. Modern absolute idealists, like Bradley, have insisted that reality is vastly different in kind from the world of appearance. In this case the parallel to Leibniz is striking, for Bradley's realm of appearance is somehow included within and the necessary manifestation of the underlying realm of reality, even though the two are totally different in nature. Or again modern scientists are telling us that the fundamental constituents of physical matter are far different from the solid, substantial character of macroscopic objects, like tables and chairs. There is not complete agreement here, but certainly it is true that many find electrons and protons to be of a fundamentally different kind of "stuff" from the gross material of ordinary experience. So far as I can see, it is impossible to show *how* these transformations come to pass—how moving charges of energy become solid mountains, how reality becomes appearance, how non-extended substances give rise to phenomenally extended bodies. This is a "mystery." It may conceal difficulties, even contradictions, but it is not obvious that it does. I am not here concerned with defending the truth of Leibniz's position or the analogous positions of Kant, Bradley, and modern physics, but with defending Leibniz against the hasty charge of propounding an absurd or impossible position.

On the other hand, this conclusion is neither so simple nor so obvious as Leibniz apparently considers it. One aspect of his reply to de Volder is particularly open to criticism. It is an argument which has recurred more than once in the complex discussion of extension in this essay. No one will question the obvious truth

of Leibniz's contention that where there is multiplicity there must be units out of which the multiplicity is composed. But must these units be metaphysically simple, in Leibniz's sense of the term? We have already seen that there are different meanings of the term simplicity. Is there any good reason for accepting Leibniz's meaning to the exclusion of all the others? Is there, for example, anything inherently absurd or contradictory in the old atomist position? Democritus said that the world is composed of extended but indivisible atoms. We may divide them in theory, but we cannot split them up in fact. But whatever is extended is continued, diffused, repeated, cries Leibniz. Quite true. The material stuff of atoms, whatever that is, is continued, diffused, repeated throughout the volume, however minute, occupied by each atom. Their unity, however, is not merely mental; it is factual. This is a tenable position. It suggests that Leibniz was quite arbitrary in insisting that we must continue our analysis or division of the extended until we arrive at the unextended and theoretically indivisible. It can be said in Leibniz's defence that he was no more arbitrary than many other rationalists, particularly rationalists of the seventeenth century. But that does not prove that his position was sound. Grant Leibniz the assumption that simplicity entails theoretical indivisibility, and his position, or something like it, follows. I am not arguing that this assumption ought not or must not be made; it may be that a more comprehensive and consistent system of metaphysics can be founded upon its acceptance than upon its rejection. All I am now insisting upon is that there is an important *assumption* involved, that it is not the self-evident principle Leibniz took it to be, and that its contradictory is not absurd.

Before passing to the final section I shall summarize briefly the main points of the present section. Is the concept of extension simple or complex? Descartes claimed that it was a simple, primitive, clear and distinct idea. Leibniz has little difficulty in showing that it is not simple but analyzable into continuity, coexistence of parts, and plurality. This raises the question of the relation of extension to what is extended. Leibniz holds that extension is an abstraction from the extended, and hence that it is ideal, incomplete, phenomenal. It follows from this that there can be no empty distance or extent. I have argued that extension is abstract in the sense of extendedness, but that any attempt to go farther than this rests on circular reasoning; for a specific

extent is abstract only if space is unreal, and the unreality of space cannot be demonstrated, as Leibniz in part tries to do, by appealing to the abstractness of specific extents. The last part of the section is concerned with the intelligibility of Leibniz's doctrine that the extended world can be constituted out of non-extended entities. I have sought to show that this doctrine is *prima facie* intelligible in the sense that there is nothing obviously contradictory in the assertion. I have questioned Leibniz's conviction that he has proved the truth of this assertion by pointing out the assumption on which it rests. His view may still be correct, but it has not been demonstrated. And this, as we shall see, is damaging to Leibniz's position, since he obviously places great reliance on the arguments of this section.

(F) *The status of extension and extended objects: conclusion.* Extension is abstract and ideal. I was forced to anticipate this conclusion in discussing the complexity of extension, and it is not necessary to repeat Leibniz's arguments for this position. It will be well, however, to supplement this view with certain related statements which Leibniz makes from time to time. The abstract and ideal character of extension put it in the realm of appearance, but they do not condemn it as chimerical.[70] It is unreal, but not a complete illusion. It is imaginary in the sense that color and heat are imaginary.[71] Thanks to the infinite divisions which actually occur in all extended objects, no body has a precise and determinate figure. The apparently definite shapes of bodies are in fact only rough and ready approximations. They appear or are perceived as definite, whereas in fact they cannot be so. Thus they are imaginary in the sense that they do not really exist as they appear.[72] In one place, indeed, Leibniz goes so far as to brand pure extension as self-contradictory. He replies to an objection of de Volder's: "Your objection—made as if I must not admit it—I do indeed admit, namely that if an extended thing were conceived through itself alone, it would not be extended, for the notion of such an extended thing implies a contradiction. I also hold for certain that what is conceived through itself alone cannot be in a place. For to be in a place is not a purely extrinsic denomination; nay, there is no purely extrinsic denomination that does not have an intrinsic one for its basis—a fact which is to my way of thinking among the *kurias doxas.*" [73]

[70] G. IV, 491–2; Langley, 329–30. [71] *Discourse,* #12.
[72] M. 163; G. VII, 314. [73] G. II, 239–40.

For Leibniz extension, space, and extended objects—the same is true of everything else involving continuous quantity such as time and motion—are in the end *phenomena bene fundata.* They are not chimeras, hallucinations. They have their own laws and order. They fall between the absolutely metaphysically real and the completely subjective and unreal. Space and all its cognate relations are the ground of the order and sequence of phenomena, the general order of all possible coexistences.[74]

It is obvious here that such a conclusion is the product of Leibniz's rationalism. Leibniz, like Bradley after him, is prepared to insist that whatever else reality is it is self-consistent. Whatever shows the slightest trace of internal inconsistency or contradiction is banished from the true heaven of reality to a purgatory which is between reality and nothingness. It is the same region, and fulfills the same function, whether called appearance or the realm of *phenomena bene fundata.* "Matter and motion are mere phenomena or contain in themselves something imaginary; and from this we can understand how diverse and contradictory hypotheses can be made concerning them—hypotheses, however, all of which completely satisfy phenomena such that no reason can be invented for determining which is to be preferred. In the world of reality, however, every truth can be accurately discovered and demonstrated."[75] Hence, like the rationalistic Bradley, Leibniz banishes extension, motion, figure, size, space, *et. al.,* to the realm of phenomena—a realm where their contradictions can live in peace and harmony with one another. Descartes was also a rationalist. The difference between him and Leibniz is not one of temper but of analysis. Descartes thought he had offered a consistent and satisfactory account of reality in terms of extension and thought. To Leibniz his attempt marked a failure of thorough-going analysis.[76] On this point Leibniz is right, whatver we may think of the very different conclusions which he seeks to base on his own analysis.

I shall conclude with some brief remarks on what Leibniz calls the labyrinth of the continuum. It will be evident to anyone who has referred to the many references given in this essay that Leibniz was much disturbed by this famous mathematical puzzle. His

[74] M. 193, 222; G. IV, 523, 568.

[75] C. 185.

[76] Cf. Langley, 13.

conviction that any continuum contains contradictions underlies much of his attack on the notion of extension. How can that phenomenal aspect of reality be ultimately real, if to be ultimately and metaphysically real is to be free from all contradictions? This is a consideration of the gravest importance for any metaphysician. It has been the root of most idealistic rejections of the world of space and time. If reality is rational, and if the continua of space and time are a maze of contradictions, then reality clearly cannot be spatial and temporal.

First, let us be clear as to the exact way in which Leibniz envisages the difficulty. Whatever is continuous involves the continuation, diffusion, repetition of the subject which is said to be continuous.[77] Now with respect to space or extension this subject cannot itself be extended, since what is extended is always further divisible. Two alternatives only seem left. Either this subject is a point and continuous extents are composed of points, or it is not a quantitative conception at all. Leibniz takes the latter alternative, using the difficulties with the doctrine of points as demonstrating the truth of his own philosophy of monads. Thus he can say that his own simple substances are more clear than the concept of extension, since the latter leads directly into the labyrinth of the continuum;[78] and again that there can be no solution to the problem so long as extension is taken to be real rather than ideal.[79] Phenomena willingly embrace contradictions; it is only reality that scorns them.

One of Leibniz's clearest treatments of the problem of the continuum is to be found in the dialogue *Pacidius Philalethi,* written in 1676. The chief subject of the dialogue is the nature of motion, but since motion can itself be viewed as continuous, it involves the concept of the spatial continuum. Can motion be the transition of an object from one point to the next? "If you admit this," says Pacidius, "all the difficulties signified by the famous name of the labyrinth burst in upon you in a throng."[80] The problem of the continuum is made to turn about the number of points in a line. Is a finite line composed of a finite or of an infinite number of points? It cannot be composed of a finite number, for the line

[77] Cf. the discussion under section (E).

[78] M. 163; G. IV, 393–4; Langley, 699–700; G. II, 262; G. VII, 314.

[79] M. 192; B&C II, 377; G. IV, 491, 502; Langley, 329–30, 334–5.

[80] C. 609.

could still be conceivably divided in such a way as to necessitate the division of a point—and this is absurd, since points are by definition indivisible. Nor can it be composed of an infinite number, for that leads to equal absurdities. If we take a rectangle and draw the diagonal, there will be one point on the diagonal for every point on each of the sides—as can be demonstrated by drawing parallels to the base from the sides. But if lines are composed of points, equal lines will have an equal number of points. Since there is an equal number of points in the side and in the diagonal, we have the absurdity of the side of a rectangle being equal to its diagonal. Or to put the same principle in another way, a section of the diagonal equal to one of the sides will have as many points as the side. But this is true of the diagonal as a whole. Therefore a part of the diagonal will be equal to the whole diagonal.[81]

It seems self-evident to Leibniz that a part cannot be equal to the whole and therefore that infinite aggregates—whether of points in a line, instants of time, members of a thing—are a contradiction in terms. He rejects the much sounder insight of Galileo who solved the paradoxes by asserting that "the words greater, equal, and less have no place in infinity."[82] Infinite numbers, as modern mathematicians have pointed out, differ in certain highly significant respects from finite numbers. "The difficulties that so long delayed the theory of infinite numbers were largely due to the fact that some, at least, of the inductive properties were wrongly judged to be such as *must* belong to all numbers; indeed it was thought that they could not be denied without contradiction. The first step in understanding infinite numbers consists in realizing the mistakenness of this view."[83] One of the inductive properties of finite numbers is that a part cannot be equal to the whole. This is not a property of infinite numbers where "equality" has the meaning of one-to-one correlation—a relation that a part of an infinite series may have to the whole of the series. Put in another way, we can say that it is one of the characteristics of infinite numbers to possess features which, put in ordinary language, sound like the paradox of the part equalling the whole. This would be a contradiction for finite numbers, but it is not for the infinite. An archrationalist like Leibniz may still be right in holding that whatever else nature is it is self-consistent, and yet wrong in attacking the

[81] C. 610–11. [82] C. 612.

[83] B. Russell, *Introduction to Mathematical Philosophy*, 79.

doctrine of infinity as self-contradictory. What Leibniz needs is a broader concept of consistency.

To say this is not to give the whole answer to the labyrinth of the continuum. There is still the problem of how a continuous extent is constituted, since it is not clear how a finite length can be composed of unextended points. Many answers have been given to this question, of which Whitehead's principle of extensive abstraction is an interesting contemporary illustration. I shall not go into this aspect of the question here. The concept of a continuum has been branded as contradictory, primarily on the ground that it involves the notion of infinite series with contradictory properties. This is Leibniz's typical attack, as we have just seen. If it can be shown that this attack is unjustified, then the usual ground for rejecting continua, one form of which is space or extension, is removed.

There are some today who are still unsatisfied with the answer that Russell and other mathematicians give, some who would hold that Leibniz was right after all. I am not a mathematician, but I shall venture to suggest one or two considerations in conclusion. First, if the argument of Russell's *Principles of Mathematics* and *Introduction to Mathematical Philosophy* (to cite only two of many recent treatments of the topic) is inconsistent or inadequate, it behooves the critics to point out the error. All too often they are content with the simple assertion of being unconvinced! Second, where so many able and honest men are in agreement, there is a certain presumption that there is some truth in their doctrine. This is not itself proof by any means, but it ought to be a caution to the critics. Finally, if it is possible to work out a theory which will permit the obvious and pervasive phenomena of ordinary life, the phenomena of space, time, and motion, to be real, such a theory has an enormous advantage over any system which, by calling them mere appearance, illusory, *phenomena bene fundata,* runs counter to ordinary experience. I am fully aware of the weakness of this plea. Familiarity is no proof in metaphysics. Still the strange and exotic have nothing in themselves to recommend them save to the jaded spirit of a perverse, if not perverted, metaphysician.

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LEIBNIZ'S PRINCIPLES OF INTERNATIONAL JUSTICE*

By Paul Schrecker

All commentators and interpreters of Leibniz agree that universality was one of the main features of his thought. To use a figure introduced by Leibniz himself, we might say that he was a living mirror of the universe—a *mirror* because he reflected more or less clearly and distinctly the whole realm of nature and civilization, and a *living* mirror because he not only passively reflected but actively shaped and concentrated the enormous variety of rays emanating from his world. Just as the monads diversely unify the infinite variety of the universe, so Leibniz's function in the history of human thought was to conciliate forces that seemed most opposed, not only of scientific and philosophic thought, but of religion, politics, and history as well.

This universality was not merely an accident of his personality; it was not the result of insatiable curiosity or the manifestation of his multifarious gifts, but rather an essential postulate of his program and the innermost core of his method not only of conceiving but of organizing the world. The world, indeed, has been divided for the practical purposes of limited creatures into separate provinces: body and soul, science and religion, theory and action, justice and politics. In reality, according to Leibniz, the universe is the creation of one indivisible and universal spirit, called God in the realm of religion, Reason in the realm of knowledge, and Justice in the realm of action.

Descartes had founded the unity of science on the unity of the human intellect in dealing with the variety of objects to which it applies itself. He had guaranteed the truth and reality of science by the veracity of God, who, he declared, could not wish to deceive us in what we perceive most clearly and distinctly. In two directions Leibniz advanced far beyond his predecessor. First, he generalized, science is not the only system whose unity is required by the unity of our intellect, which demands unity of our entire human civilization. If conflicts arise between various religions, between science and religion, between justice and particular

* Read at the meeting in celebration of the tercentenary of Leibniz held by the Conference on Methods in Philosophy and the Sciences at the New School for Social Research, New York City, May 5, 1946.

interests, or between theory and practice, these conflicts are of the same order as the inconsistencies and contradictions which, without prejudice to its ideal unity, science contains at every stage of its history. The progress of science consists in gradually eliminating inconsistencies within the system, and contradictions between any system and experience. The same is true of the totality of civilization. Conflicts springing up between its several divisions are imperfections brought about by human limitation. But they are by no means phenomena before which we have to capitulate. All human effort, therefore, must be devoted to overcoming these conflicts which are symptoms of disturbances that can be cured.

It is true that the unity of civilization is thus never actually reached. But neither is the unity of science, which is nevertheless the aim that inspires all research. This is Leibniz's first extension of the Cartesian postulate of the unity of science. Despite the diversity of aims pursued in its various fields, civilization is a potential unity, and every effort ought to be devoted to actualizing this potentiality.

There is still another direction of no minor importance in which Leibniz universalized the Cartesian conception. According to Descartes, all truths, even those of reason, have their source in God's unfathomable will. This mediatization of truth is absolutely inconceivable to Leibniz. Truths of reason, that is, those the contrary of which implies self-contradiction, are, as he says, more inviolable than the Styx, and God Himself cannot but respect them in His creation. We do not, therefore, need any additional guarantee for these truths, their very necessity warranting their reality. This principle would, however, be insufficient and ineffectual in the field of action were it not inseparably accompanied by another which completes it and renders it practicable. What reason is to knowledge, justice is to action. And the principles of justice are as independent of the Divine Will as necessary truths are of the Divine Intellect. Now, since in the divine unity two definite perfections, wisdom and justice, can never be at variance, injustice can never be reasonable, nor can disobedience to reason ever be just. No incongruity is thus possible between true theory and just action. Truth and justice are the two correlative universal ideas which should dominate the entire field of human conduct.

These two sovereign and seemingly very simple ideas are the key to the often cryptic achievements of Leibniz. Just as a small

number of axioms virtually contain the whole of geometry, so the ideas of reason and justice virtually contain all manifestations of genuine civilization.

Whereas, however, the idea of reason as conceived by Leibniz seems incontrovertible, the idea of justice, alas, appears much less solidly founded and still less universally recognized. For while we have a fairly good idea, imperfect as it may be, of what is to be understood by the concept of truth, while the reach of this idea has been considerably enlarged during the course of history, while it may rely upon a certain number of indubitable principles—justice, on the contrary, seems a word devoid of any precise meaning, or at least subject to such wide variations in space and time that it appears ridiculous to proclaim it the sovereign principle of human actions. History, moreover, does not seem to lead to the progress of justice as it undoubtedly has led to the progress of knowledge. Where, indeed, is the stable starting-point which would correspond in the field of action to the first and indubitable principles which guarantee the progress of our knowledge? Is there one single principle of justice as generally and universally accepted as the principle which expresses the contrary of justice, namely, that might destroys right?

In opposition to these sceptical and cynical objections, Leibniz affirmed the certainty and actuality of an idea of justice, the content of which may vary constantly, and which, moreover, may be ceaselessly violated by positive law as well as by the actual conduct and condition of man, but which nevertheless remains the only idea capable of directing human action towards the general good. No civilized society aiming at the improvement of its civilization would indeed be possible, were it to renounce the idea of justice. This certainty, according to Leibniz, rests on first principles of life in society, which are as incontrovertible and valid as the axioms of logic.

What are these principles of justice called upon to unify human society, analogous to the principles of reason which unify our knowledge? Leibniz first proclaims a universal principle, namely, that everything must be directed towards the general good. This supreme norm is articulated by three more particular principles which Leibniz borrowed from the Roman lawyers and which correspond to the traditional three degrees of justice. The first, expressing strict law, is: *Neminem laedere*—to harm no one; the

second, expressing equity, is: *Suum cuique tribuere*—to grant to each what is his; finally, the highest degree, called piety by Leibniz, is the expression not of particular but of universal justice, or as we should rather call it, of morality, and runs: *Honeste vivere*—to live honestly.[1]

What is common to these principles is that they are purely formal and not substantive, just as truths of reason grasp only the order of things, not their substance. They do not suggest, therefore, any concrete decisions to be taken in individual cases. Here, too, the analogy with formal science is complete, since material laws of nature, constants, for instance, are not deducible from logical and mathematical principles. And if the common aim of these principles of justice is to direct human actions toward the general good, they fail to teach us what the general good is. Leibniz tried to elaborate on these principles by defining justice as the conduct of the *vir bonus*. This, however, by no means renders easier unequivocal decisions, since every civilization produces a different ideal type of *vir bonus*.

A closer analysis of the principles of justice, however, shows that their function is not at all to determine human actions directly and immediately, but to serve as regulative principles for the legislation and government of civilized communities. Here again there is a striking analogy to the truths of reason. These truths, indeed, neither serve nor suffice to determine facts, but only to create a method leading towards comprehending facts in one single and consistent system of knowledge. The principle of contradiction, for instance, prescribes the admission of a proposition into the scientific system or its exclusion therefrom, but not its discovery. The same is true of the social system. If, and in so far as, its legislation and government do not comply with the principles of justice, they must be rejected. For then this society is not a lawful community, but only a *de facto* association, not distinguishable from the well-organized gangster-band bound merely by egoistic interests and fear.

Truths of reason, Leibniz stated, are those the contrary of which implies self-contradiction. Should it not be possible be formulate a similar definition for the principles of justice? The analogy seems to be unquestionable. Can a system of law or a govern-

[1] *Codicis Juris Gentium Praefatio* (*Werke*, ed. Onno Klopp, VI, 457 sq.); *Mittheilungen aus Leibnizens ungedruckten Schriften*, ed. Mollat, 5, 8, etc.

ment be conceived, constituted by principles diametrically opposed to those Leibniz considered the axioms of justice? Can we imagine a genuine civilization reposing on the principle that everyone ought to harm everyone else or to refuse every man what is his? Such a civilization would necessarily involve a moral obligation to dishonesty. It would consider it honest to be dishonest, virtuous to be without virtue, and pious to be impious. A more obvious contradiction can hardly be imagined.

True, the determination of an unjust injury or the criterion of property is variable, just as is the criterion of honesty and piety. This variability, however, by no means destroys the value of the principles, the less so since the same applies to the truths of reason. Two and two are four, whatever may be the nature and reality of the objects counted. Two unicorns and two unicorns are four unicorns, even though none may ever have existed, and it is certainly not the business of arithmetic to decide upon this issue. Just as the power of the truths of reason appears most conspicuously where they have been neglected, from the very absurdity of the result, so also is the power of the sovereign idea of justice evinced in the very cases in which it is most flagrantly violated. Never, indeed, in the course of history has might destroyed right without veiling its misdeed behind a mask of sham reason and sham justice. Often a pseudo-principle of justice has been evoked in order to cloak the worst kinds of violence in the guise of justice.

Leibniz frequently defined justice as *caritas sapientis,* the charity or benevolence of the wise. It is, indeed, inconceivable that injustice could conform to universal reason wherein the wise participates, since "by obeying reason one carries out the orders of Supreme Reason."[2] The harmony between reason and justice is thereby proven complete, and justice is nothing else but "what complies with wisdom and goodness joined together."[3] These two inseparable ideas thus define the general aim of civilization as well as the duty of anyone wishing to participate in it. By fulfilling this duty, that is, by following reason and justice, man actually is made to God's likeness. "Indeed," wrote Leibniz, "His goodness and justice as well as His wisdom are different from ours only because they are infinitely more perfect."[4]

[2] *Philosophische Schriften,* ed. Gerhardt, VI, 27.

[3] Ed. Mollat, 48.

[4] Ed. Gerhardt, VI, 51.

How can these principles apply to the organization of social life? Again the analogy to the truths of reason may provide a clue. Just as every true proposition must be capable of figuring in one and the same consistent system of knowledge, so also there can be no irreconcilable conflict between individuals and communities, nations, churches, or classes, in so far as they are inspired by the universal ideas of reason and justice. The use of brute force, constraint, and persecution exercised for the purpose of fighting adverse doctrines and convictions is, therefore, always an infallible symptom of a defection from reason and justice.

These are the principles which Leibniz, even in his adolescence, indefatigably attempted to apply to the conflicts which had provoked the Thirty Years' War. Wherever he turned, he observed moral and material devastation, the aftermath of the conflict, which the Peace of Westphalia had not succeeded in eliminating. The main ideological struggle was that between the Roman Catholic and Protestant Churches, together with the dissension of the Protestant Churches themselves, Lutheran and Calvinist, the latter evincing at times more violent bitterness than the hatred both entertained for the common enemy. From his twentieth year to his death, Leibniz devoted himself to reconciling the churches. The history of these attempts at reunion and union has often been written, though much important material still remains unpublished.

The principles, however, which inspired his activity in this direction have hardly ever been clarified. Since each denomination and each of the many Christian sects conceived itself as the genuine depository of the true Christian religion, and since reason and justice exclude the possibility of there being more than one, the problem arose as to whether the apparent divergencies dividing the several doctrines really existed, and if so, whether they were fundamental and barred the union of all believers in one single and oecumenic community. Now, what instrument would be of more avail for the purpose of resolving this problem than reason which participates in Supreme Reason? and what norm would be more competent to rule relations among the Churches than the idea of justice, derived from divine goodness? Rational analysis thus became in fact the method to which Leibniz subjected the principal divergencies of the Christian denominations. And he reached the conclusion that the doctrinal antagonisms were only

quarrels about words, and that wherever genuine dogmatic differences existed, they were not fundamental and did not present any real obstacle to reconciliation. Just as the Roman Catholic Church, without prejudice to its unity, embraced doctrines as divergent as those of Saint Augustine and Aquinas, oecumenic Christian unity would not necessarily demand complete uniformity of doctrines.

Here again the idea of monads may be applied. Each of the Churches represents the same divine institution, though each represents it from a different viewpoint. Schisms are, therefore, contrary to reason. And the effect they have had—religious wars and the bloody persecutions of heretics and non-conformists—are also contrary to justice, divine as well as human. "I believe," wrote Leibniz to Father Des Bosses,[5] "that persecutions of doctrines which do not instigate crime are the worst of all things, and that one should not only abstain from such persecutions, but strive to make them execrated by those over whom we have some authority. It is permissible to refuse honors and advantages to which they are not entitled to those who abet doctrines we deem harmful. But I do not think it permissible to confiscate their property, and still less to use rigor against them, by means of proscriptions, chains, the galleys, and evils still worse. Is this not, indeed, a species of violence which one could not escape but by a crime, to wit, by forswearing what one believes to be true? The greater a man's value the more he will suffer under this tyranny."

The reconciliation of the Christian Churches demanded by reason and justice thus seemed to Leibniz an indispensable condition for the pacification of Europe. Unfortunately for us, the antagonism between ideologies which engenders cataclysms merely suffers changes of form. If religious wars, since the American and the French Revolutions, have become obsolete, wars under some other ideological pretext have not been suppressed by the decay of religious passions. However, everything Leibniz denounced as unreasonable and unjust in those religious struggles holds still more strongly for the ideological divergencies which have replaced them. The new credos, be they economic, philosophic, national, or what not do not even share the incomparably higher dignity of religious ideals or the legitimate claim to universality naturally inherent in them. Whatever the ideological motives for

[5] Ed. Gerhardt, II, 337 (Original text in Latin).

the recourse to brute force, the universal ideas of reason and justice reject them *a priori* as incompatible with genuine civilization.

Such are the reasons which moved Leibniz to execrate war between civilized nations. "War," he wrote,[6] "is the state where one avows the intention of fighting by force for the purpose of obtaining something. If we could believe that God always grants victory to the just cause, war would be an appeal to divine judgment or a kind of decision by lot. God, however, for other and stronger reasons, allows the unjust cause the greater weight. This is why an appeal to divine judgment amounts to tempting God, just as if one wanted to test whether there is a God or whether He is just, starting from the erroneous conviction that God cannot allow evil." More than a hundred years later, Fichte used the same argument, stating that "war would be a safe and perfectly legitimate means of securing lawfulness in international relations if one could only find a means of always assuring victory to the defendant of the just cause."[7] To prevent the victory of a nation which seeks to violate justice in international relations or at least to render such a victory more difficult and less probable—is this not one of the main objectives of the United Nations Organization?

What did Leibniz think of the possibility of such an international organization? He shared the opinion of Hobbes that in the state of nature man is a wolf to his fellow-man. What has ended the war of all against all and given birth to civil society organized in the State is civilization, that is, the reign of law, which, following the elementary principles already pointed out, forbids the commission of harm against anyone, guarantees everyone the possession of what is his, and aims at the common good. Thus the state is called upon to be the framework of any civilization, provided it is based on the idea of justice. "The aim of political science with respect to the doctrine concerning the forms of government," wrote Leibniz,[8] "ought to be to promote the flourishing of the authority of reason. . . . Arbitrary power is the form of government directly opposed to the authority of reason." It would, indeed, be absurd and blasphemous to exempt a despot from the laws of justice and reason, to which, according to Leibniz,

[6] *Opuscules*, ed. Couturat, 507 (Latin).

[7] *Grundlage des Naturrechts* (1797), II, 260 (German).

[8] Ed. Gerhardt, III, 277 (French).

God Himself is subject as the Creator and Supreme Governor of the world.

Leibniz was perfectly conscious of the dangers involved in autocracy, and he stated that frequently the insomnia of a prince and his resultant bad temper have provoked decisions bringing death to thousands of human beings.[9] However, just as Leibniz was opposed to any form of despotism, so was he also opposed to granting arbitrary freedom to the citizens. "True liberty," he wrote,[10] "is one of the greatest jewels of human nature, but comes after reason. Liberty, indeed, should be nothing else but the capacity of following reason." Since one and the same reason is called to direct the legislation and the government of a State as well as the conduct of every citizen, no legitimate conflict can arise between just law and reasonable liberty.

Still more than between men in the state of nature is war the natural relation between States, so much so that, as Leibniz wrote, peace between the Powers is only like the intermission in a fight between gladiators when they get a breathing spell.[11] This means that in the state of nature peace between the nations is not a rule of law, but only a *de facto* state without guarantee of duration and without sanction against infractions. However, Leibniz declared,[12] "just as, when the state is established by men who have not before been bound by obligations, each one binds himself by a common tie, so also several sovereign powers may accept a common tie as if they were as many free persons, be it by law, or by a declaration of their will, or by custom." What Leibniz proposed here was in the nature of a covenant or social contract between nations, and the idea which inspired him was the analogy between isolated states and isolated individuals. Just as the relations between the citizens of one and the same state are not ruled by arbitrary force, but by positive law, so also the relations of the states among themselves may be governed by a system of positive law, subject, like the positive law of the state, to the principles of reason and justice. By this means Leibniz attempted to overcome the conflict, still acute today, between the idea of national sovereignty and the idea of international law. Since national

[9] *Cod. Jur. Gent. Praefatio.*

[10] Ed. Gerhardt, III, 278 (French).

[11] *Cod. Jur. Gent. Praefatio.*

[12] *Opera*, ed. Dutens, IV, 270 sq. (Latin).

sovereignty is a legitimate claim only in so far as it respects the ideas of reason and justice, and since these same ideas ought to control international law, no justifiable antagonism between the two systems seemed possible.

The execution of any general plan for the pacification of the world may proceed along two different paths, analytically or synthetically, as it were. One may first elaborate on what, at a given point of time, international relations actually imply as reciprocal obligations, either in the form of treaties or of usage. One may, on the other hand, strive to establish a universal organization of civilized states ruled by a constitutional charter which would determine the lawful working of this society of nations. Leibniz devoted himself mainly to the former task, a task for the historian and jurist. But, as will soon appear, he by no means neglected the problem of political synthesis. The assiduous work he devoted in the first direction produced his *Codex Juris Gentium Diplomaticus* of 1693, followed, in 1700, by a supplement, the *Mantissa*. They contain a compilation of the most important international treaties, pacts, and other documents beginning with the 11th century which evince the existence of certain rules of international law established and accepted *via facti*.

But, disregarding the historical interest presented by such a collection, does it prove anything with regard to international law? Most of these pacts were not abrogated by agreement of the contracting parties, but died a violent death. Far from testifying to the value of international law, this graveyard of broken engagements seems an impressive monument to the powerlessness of law in international relations. Whereas agreements between private persons are guaranteed execution by positive law, pacts between sovereign states seem to be valid only so long as the stronger stipulator so desires it. This, of course, is a fact it would be absurd to deny. However, as Grotius had already pointed out, a right without coercive power is not thereby rendered ineffective. The absence of power capable of enforcing respect for international obligations does not destroy international law any more than an unpunished crime destroys penal law.

Logically, the voluntary conclusion of treaties between sovereign states doubtless implies recognition of at least that international law which imposes strict compliance and qualifies the breach of stipulated engagements as unlawful and unjust acts. The prin-

ciple qualifying such infractions as unjust derives directly from the first principles of justice proposed by Leibniz. What could be more obviously contrary to the *suum cuique tribuere* than not to grant to a state possession of what has been voluntarily recognized by a pact as legally belonging to it? Or what could be more strikingly contrary to the *neminem laedere* than to inflict upon a state an evil to abstain from which the contracting partner has expressly engaged himself?

The first commandment of international law and the basis of all others is therefore, according to Leibniz, the faithful observance of treaties. In the preface to the *Codex* he violently attacked those Powers which, as he says, play with treaties as children with nuts. He does not admit that alleged obligations of honor may justify or even excuse violations of the given word. "All obligations of law," he wrote,[13] "are also obligations of honor, above all those which derive from the pledged word: it is dishonest to violate them even if one may sometimes have excuses which would be valid if taken in the strict sense, but which are suitable for lawyers rather than princes. Honest people, the world at large, posterity, and our own conscience are not always satisfied with what may be valid in the courts." And in another passage Leibniz expressly and sarcastically opposed the widespread abuse of allowing considerations of prestige to prevail over considerations of justice.[14]

Pufendorf was therefore wrong, according to Leibniz, in denying that nations could create international law by their agreements, and in basing his denial on the absence of any superior power capable of enforcing the obligations deriving from these pacts.[15] Those, indeed, wrote Leibniz,[16] "who base all obligations on constraint and consequently take power for the standard of law," fall back on "the concept implied by that tyrannical definition of Plato's Thrasymachus, who said that justice is nothing but what pleases the most powerful."

The historical development of international relations embodied in pacts and alliances thus necessarily implies the recognition of international law founded on the idea of justice. Any violation of this law consequently appears as a heinous offense against jus-

[13] Ed. Klopp, V, 253 (French).

[14] Ed. Gerhardt, VII, 509.

[15] Ed. Dutens, IV/3, 275.

[16] Ed. Gerhardt, VI, 35.

tice. These considerations lead to the proscription of war as a means of international policy. They demand that the most energetic and tenacious efforts of the peace-loving nations be directed towards creating an efficient organization for the observation of treaties. This observation should not merely comply with their always ambiguous texts, but with the spirit of reason and justice, which is the unique source of their strength. Loyalty thus becomes the capital virtue of statesmen. "To preach love of peace," wrote Leibniz,[17] "when one makes others feel all the effects of war, to refuse the allegation of rights, to refuse to consider modifications, to dictate equivalences and strict conditions; not to tolerate precautions taken by others in making alliances or levying troops, openly to mock the given word, to pretend such reasons as one is wont to invent for putting off simple and stupid persons when desiring to ridicule them, to add chicanery to violence and insult to spoils—these are traits a thousand times worse even than ruin."

While abhorring war and considering it not merely impious, but even inept,[18] Leibniz did not neglect the necessity of taking precautionary measures against a neighbor whose policy might not be inspired by the ideas constituting civilization. He by no means adopted the absolute pacifism of non-resistance to evil, but, on the contrary, insisted on the duty of being strong and contributing all sacrifices necessary to one's efficient defense against unjust aggression. Nor would he have agreed to a policy of appeasement and expediency. "By concessions and disgraceful submissions," he wrote,[19] "minds will become more and more intimidated and depressed; they will eventually lose their sensitivity, become callous to maltreatment and accustomed to patience. It will seem as if this had to be so owing to a decree of fate. Finally, all will travel the road to serfdom."

Leibniz even concerned himself with the technical and organizational details of mobilization and armament necessary to the safeguarding of liberty and law against warlike nations, and he violently attacked the use of inhuman arms, specifically bombs, that "result of human ingenuity for inventing new evils," which within "a small cone carry the force of an earthquake and in a few hours destroy the work of centuries." [20]

[17] Ed. Klopp, V, 254 (French). [18] *Ibid.*, II, 221.

[19] *Ibid.*, V, 255 (French).

[20] *In Bombos Epigramma*, ed. Klopp, V, 636.

As already pointed out, Leibniz, while particularly concerned with the analytical methods of developing international law, did not neglect the pacification of the world by synthetic means, that is, by the creation of an international organization of civilized nations. Thus, when asked his advice on the *"Projet pour rendre la Paix perpétuelle en Europe"* of the Abbé Castel de St. Pierre, he agreed in principle to its proposals. "It is very certain," he wrote,[21] "that if men wanted to, they could free themselves from those three great scourges: war, pestilence, and famine. As to the two latter, any sovereign could do it. But against war an agreement of the sovereigns would be necessary, which it is difficult to obtain."

Sectarianism under whatever name, so much execrated by Leibniz, he rightly expected to oppose itself to the realization of this aim; sectarianism, which, as he wrote,[22] "consists in insisting that others rule their conduct by our maxims, while we should be satisfied with seeing that all approach the principal aim." This principal aim is not the welfare of one nation, one class, or one race gained at the expense of all others, it is not the hegemony of any one people believing themselves called upon to rule the world, it is the welfare of mankind. "Provided something of consequence is achieved," he wrote to a French friend,[23] "it is indifferent to me whether it originates in Germany or in France, for I desire the welfare of mankind; I am neither a philhellene nor a philoroman, but a philanthropist." And in a letter to Count Golofkin, chancelor to Czar Peter the Great, he declared: "I do not discriminate against any one nation or party, and I would prefer to see the sciences rendered flourishing in Russa, to seeing them poorly cultivated in Germany. The countries where they prosper best will be the most dear to me, since the whole human race will always profit therefrom, and the real treasures of the human race will thereby be increased. The real treasures of mankind are the arts and the sciences. They distinguish man from beast and cultivated peoples from barbarians."[24]

These are but a few quotations illustrating how Leibniz applied his fundamental ideas to what we may call the rationalization of international relations. They will suffice, I hope, to prove that

[21] Ed. Gerhardt, III, 637 (French).

[22] Ed. Dutens, I, 470 (French).

[23] Ed. Gerhardt, VII, 456 (French).

[24] *Oeuvres*, ed. Foucher de Careil, VII, 503 (French).

Leibniz's ideas were by no means the more or less utopian dreams and illusions of a doctrinaire spirit alien to the realities of the world. Leibniz's thought was, on the contrary, thoroughly realistic. But the reality he envisaged was not confined within the horizon of those narrow-minded politicians whose reach does not stretch far beyond what their eyes can see and their hands can grasp.

Leibniz's hope of promoting the establishment of international law designed to rule the relations of nations, analogous to the law that rules the relations of the citizens of one and the same civilized state—this hope rested on the universality of his ideas of reason and justice. The international law he strove for aimed at actualizing the community of mankind without impairing the liberty of the many individual nations to cultivate their particular civilizations. Leibniz knew very well that this task could not be carried out in one generation, or in one century. But he was also convinced that every action complying with the laws of reason and justice would contribute, be it but to an infinitesimal degree, to approaching the aim. In one of his letters to the Landgraf Ernst of Hesse-Rheinfels he presented this paraphrase of an old Latin adage: *Labora diligenter, semper aliquid haeret*—Work diligently, something of it will always remain.

The history of civilization is, of course, no continuous progress, and sporadic relapses into barbarism may always be expected to occur. The spiritual forces of mankind are, indeed, limited and rather quickly exhausted. However, in order to crush civilization it would be necessary, said Leibniz,[25] "for all functions and the entire authority to be in the hands of military men who would have to be barbarians, enemies of science, and who would have to set out to destroy intellectuals as the disturbers of public peace." An alliance of militarism and anti-intellectualism, this is what Leibniz considered the deadly enemy of civilization.

Our own epoch presents in this respect a state of mind very similar to that which, near the end of his life, moved Leibniz to this pathetic complaint: "It is the misfortune of mankind to be finally disgusted with reason itself and weary of light. Chimeras begin to return and to please because they have something mysterious."[26] How many chimerical mysticisms, irrationalisms,

[25] Ed. Gerhardt, VII, 162 (French).

[26] *Ibid.*, VII, 417 (French).

and charlatanisms disguised as science have we seen reborn, which we believed definitively conjured away by the progress of civilization? However, all such set-backs were incapable of affecting Leibniz's optimism, so often mocked at and so rarely understood. What, indeed, could be more optimistic than his conception of a world in which only very few things are apparently conformable to reason and to justice, but which tends naturally to carry out those supreme ideas in all the walks of civilization? His optimism was never seriously shaken, despite all the blows his conciliatory and pacificatory attempts suffered time and again in all the fields of his activity. His perseverance found the most simple and also the most pathetic expression in the passage of a letter he wrote an old friend after a renewed, seemingly final, defeat of his project for the union of the churches: "*Ipsa se res aliquando conficiet*"—Some day the thing will by itself break into reality.[27]

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[27] *Epistolae ad diversos*, ed. Kortholt, I. 124.

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ABBOT SUGER ON THE ABBEY CHURCH OF ST. DENIS AND ITS ART TREASURES. Edited, translated and annotated by Erwin Panofsky. Princeton University Press, 1946. Pp. 250. Illustrations. $3.75.—The abbot's reports, in Latin and in English translation, are interpreted, in Mr. Panofsky's introduction, in the light of the political and theological tendencies of the early twelfth century, as well as of the abbott's personality.

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PERIODICALS AND REPRINTS RECEIVED

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CORRECTION

Dr. Morris Keeton has kindly called my attention to an error I made in transcribing from my notes the wrong date 1855 for the appearance of Mill's *Examination of the Philosophy of Sir William Hamilton* (this *Journal*, June 1946, page 323). The inference I made in the sentence in which that erroneous date appeared, namely, that Chauncey Wright passed from the influence of Hamilton to that of Mill before Darwin's work appeared in 1859, is, hence, wrong. In my April article on "Peirce's Metaphysical Club and the Genesis of Pragmatism," the date 1865 for Mill's *Examination* was given correctly.—Philip P. Wiener.

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